

U. S. DEPARTMENT OF COMMERCE

ROY D. CHAPIN, Secretary

GOVERNMENT COPY

# STANDARDS YEARBOOK

1933

Compiled by

THE BUREAU OF STANDARDS

LYMAN J. BRIGGS, Acting Director

Bureau of Standards Miscellaneous Publication No. 139



UNITED STATES

GOVERNMENT PRINTING OFFICE

WASHINGTON : 1933

For sale by the Superintendent of Documents, Washington, D. C. - - - - Price \$1.00 (cloth)

## LETTER OF SUBMITTAL

---

DEPARTMENT OF COMMERCE,  
BUREAU OF STANDARDS,  
*Washington, November 1, 1932.*

SIR: I have the honor to submit herewith for publication the seventh issue of the Standards Yearbook.

The present volume contains outlines of the standardization activities and accomplishments of not only the Bureau of Standards and other agencies of the Federal Government and the States and counties but also those of national technical societies and trade associations. There is also presented a picture of the standardization movement in various fields of industry conducted by certain national and international agencies.

Special attention has been paid to the current standardization programs of American standardizing agencies, their accomplishments to date, with special reference to the year just past, without reproducing the information concerning their methods of appointing standardizing committees, authority bestowed upon these committees, and their functions and procedure, which can be found in previous editions of the Standards Yearbook. An attempt has been made in this issue to include in the outlines such methods as are employed by these agencies for making their standards and specifications effective throughout industry and to determine whether or not their requirements are being complied with.

The Standards Yearbook is proving of much value to manufacturers, industrial experts, and engineers, as well as to purchasing agents, both governmental and general.

Respectfully,

LYMAN J. BRIGGS,  
*Acting Director, Bureau of Standards.*

Hon. ROY D. CHAPIN,  
*Secretary of Commerce.*

# CONTENTS

	Page
I. Establishing and maintaining standards.....	1
II. International standardizing agencies.....	3
International Bureau of Weights and Measures.....	3
International Astronomical Union.....	4
International Union of Geodesy and Geophysics.....	4
American Geophysical Union (American section, International Union of Geodesy and Geophysics).....	5
International Geodetic Activities.....	8
International Electrotechnical Commission.....	9
International Technical Consulting Committee on Radio Com- munication.....	11
International Scientific Radio Union.....	12
International Commission on Illumination.....	12
International Federation of Standardizing Associations.....	13
International Electrical Congress.....	13
Imperial Economic Conference.....	13
International Congress of Scientific and Applied Photography.....	16
International Congress on Light.....	17
International Commission for Uniform Methods of Sugar Analysis.....	18
New International Association for Testing Materials.....	19
International Technical Committee of Aerial Legal Experts.....	20
III. National standardizing laboratories.....	22
Bureau of Standards.....	22
National Physical Laboratory.....	22
Physikalisch-Technische Reichsanstalt.....	26
Laboratoire D'Essais (Mécaniques, Physiques, Chimiques, et de Machines).....	31
Laboratoire Central d'Electricité.....	34
National Research Council (Canada).....	35
Electrotechnical Laboratory.....	40
Tokyo Industrial Laboratory.....	42
Munitions Supply Laboratories.....	43
Office National des Recherches Scientifiques et Industrielles et des Inventions.....	44
USSR Scientific Research Institute of Metrology and Stand- ardization (VIMS).....	45
IV. National industrial standardizing bodies.....	47
Australia.....	48
Austria.....	49
Belgium.....	52
Canada.....	53
Czechoslovakia.....	53
Denmark.....	55
Finland.....	55
France.....	56
Germany.....	57
Great Britain.....	59
Hungary.....	60
Italy.....	61
Japan.....	61
Netherlands.....	62
Norway.....	62
Poland.....	63
Rumania.....	63
Sweden.....	65
Switzerland.....	66
Union of Soviet Socialist Republics (Russia).....	67
United States of America.....	68

	Page
V. Federal standardizing agencies (U. S. A.)	69
Executive departments	69
Department of Agriculture	69
Bureau of Agricultural Economics	69
Bureau of Chemistry and Soils	69
Bureau of Home Economics	71
Bureau of Plant Industry	71
Bureau of Public Roads	71
Food and Drug Administration	72
Forest Service	72
Department of Commerce	73
Aeronautics Branch	73
Bureau of the Census	73
Bureau of Fisheries	73
Bureau of Lighthouses	74
Bureau of Mines	74
Bureau of Standards ( <i>see</i> Sec. VI)	75
Coast and Geodetic Survey	76
Department of the Interior	77
Office of the Secretary	77
Bureau of Reclamation	77
Geological Survey	77
Office of Indian Affairs	78
Department of Labor	78
Bureau of Labor Statistics	78
Children's Bureau	79
Women's Bureau	80
Navy Department	80
Office of Naval Operations	80
Bureau of Aeronautics	80
Bureau of Construction and Repair	81
Bureau of Engineering	82
Bureau of Medicine and Surgery	82
Bureau of Navigation	82
Bureau of Ordnance	83
Bureau of Supplies and Accounts	83
Bureau of Yards and Docks	83
United States Marine Corps	84
Treasury Department	84
Coast Guard	84
Public Health Service	84
War Department	85
Independent establishments	88
Comptroller General of the United States	88
Federal Coordinating Service	89
Office of the Chief Coordinator	89
Federal Purchasing Board	89
Federal Specifications Board	89
Federal Standard Stock Catalogue Board	91
Federal Statistics Board	92
Federal Traffic Board	92
Interdepartmental Board of Contracts and Adjustments	92
Interdepartmental Board on Simplified Office Procedure	92
Permanent Conference on Printing	93
Federal Trade Commission	93
Government Printing Office	93
National Advisory Committee for Aeronautics	93
National Screw Thread Commission	94
Panama Canal	94
Public Buildings and Public Parks of the National Capital	94
Smithsonian Institution	94
United States Bureau of Efficiency	95
United States Civil Service Commission	95
United States Employees' Compensation Commission	95
United States Shipping Board	96
Veterans' Administration	96



	Page
VI. Bureau of Standards.....	97
Relation to governmental agencies.....	97
Relation to science, commerce, and industry.....	97
Publications.....	97
Research and testing.....	98
Research.....	98
Testing.....	102
Commercial standardization.....	102
Advisory committees.....	103
Other cooperative activities.....	108
Some activities and accomplishments.....	108
Practical application.....	108
Aeronautics.....	108
Automotive engineering.....	110
Building and housing and building construction.....	111
Cement and concrete.....	113
Chemical analysis.....	115
Clay and silicate products.....	116
Colorimetry and photometry.....	118
Commercial standards.....	119
Dental materials and methods.....	120
Electrical units and measurements.....	120
Fire resistance.....	122
Friction and lubrication.....	123
Gas analysis and service.....	123
Glass and vitreous enamels.....	124
Heat and temperature measurements.....	125
Hydraulics.....	126
Identification of guns, bullets, and documents.....	127
Instruments and appliances.....	127
Leather.....	129
Lime and gypsum.....	130
Metals.....	130
Metrology.....	134
Paper.....	135
Photography.....	136
Physical constants.....	137
Protective coatings.....	138
Radio.....	138
Rubber.....	139
Safety standards.....	140
Scales in railroad, industrial, and other services.....	140
Simplified practice.....	141
Specifications.....	142
Spectroscopy, atomic structure, and radium.....	143
Stone.....	144
Sugar.....	144
Textiles, dyes, cleaning, etc.....	145
Therapeutic accessories.....	147
Time measuring and recording instruments.....	147
Waste products from the land.....	147
Weights and measures.....	148
VII. County and State purchasing agencies.....	151
County purchasing agencies.....	151
State purchasing agencies.....	155
Alphabetical list of State purchasing agencies.....	160
VIII. General standardizing agencies (U. S. A.).....	164
American Standards Association.....	164
American Marine Standards Committee.....	166
American Society for Testing Materials.....	167
Central Committee on Lumber Standards.....	170
IX. Standardizing activities of technical societies and trade associations.....	172
Standardizing agencies alphabetically arranged.....	172
X. Bibliography on standardization.....	231
Index.....	245



# STANDARDS YEARBOOK, 1933

---

## I. ESTABLISHING AND MAINTAINING STANDARDS

Although the Constitution gives to the Federal Government the same jurisdiction on weights and measures as it does over coinage, the Congress has left to the States the enactment of laws and their enforcement as related to weights and measures, except as to food products and their containers, a field of activity administered by the United States Department of Agriculture.

The Bureau of Standards maintains for the country the basic standards relating to weights and measures, thus giving to the State authorities and trade the opportunity to secure uniformity everywhere. The attainment of this highly desirable uniformity not only as to the weights and measures themselves, but their tolerances and technique of use, is greatly enhanced through the proceedings of the National Conference on Weights and Measures held at the Bureau of Standards, and participated in by State officials and manufacturers of equipment.

In formulating their recommendations relating to the construction and operation of weighing, measuring, and testing equipment, the conference and the Bureau of Standards give due consideration to suggestions received from both the makers and the users of the apparatus as well as those of the law makers and the legalized inspectors.

Track scales owned by the railroads and industries throughout the country, which form the basis of charges for freight moving in carload lots and assessed on the weight basis, are tested by the Bureau of Standards under the direction of Congress. The bureau also calibrates annually each of the 20 master track scales throughout the United States employed for the purpose of determining the weights of test cars used by the railroads and industry in testing and adjusting the commercial track scales.

Each State and each of the larger cities has its own complete set of accurate standards of all the usual commercial measurements of quantities, the standard lengths, weights, and capacity measure, furnished and certified by the Bureau of Standards.

Not only is national business dependent upon a centralized system of weights and measures, but international trade also must have uniformity. For this reason the bureau maintains the closest possible relationship with the similar organizations in foreign countries, whereby commodities weighed or measured here in yards, feet, or pounds can be checked accurately in any other country in meters or kilograms, or whatever system is there used.

In recent years this international cooperation has been extended to standards of interest to other industries. There is now estab-

lished an international temperature scale, and questions relating to heat units are in the process of adjustment. The electrical units are also being revised through international agreement as well as the standard of light on which our illumination practices are based. International agreement on the X-ray standard of dosage is at hand as well as a revision of sugar standards. In all of these international agreements, as well as others, the bureau is taking an active part for the benefit of American business.

Information concerning the numerous international standardizing agencies, and standardizing activities conducted on a national basis throughout the world, is given in Chapters II, III, and IV.

One of the outstanding characteristics of business during the past quarter of a century has been the development of trade and technical associations representing the various branches of business and industry in the United States. Many of these associations are collectively interested in problems of standardization and improvement of their products through experimental research. Although the individual members of such a group may be in keen competition with each other, nevertheless there are many problems of common interest relating to standards and quality, and the whole industry is advanced by concentrated effort on the part of the industry as a whole. In the solution of such common problems, business, through these associations, on their own initiative, has taken advantage of the opportunity and advantage of cooperation with the Government bureaus in many instances.

To an ever-increasing extent trade associations, technical societies, and organized consumer groups are cooperating in not only the establishment, but also the maintenance of standards of quality in commodities in which they are particularly interested.

Standards of quality have to be set up and maintained for the commodities of trade, and specifications must be established to define the characteristic properties of these commodities, to avoid confusion as between buyer and seller. As the greatest purchasing organization in the country, the Federal Government finds it economical to cooperate with business in matters of quality standards.

The more refined and more highly developed an industry is, the more exacting become the requirements for measurement, and the continuous control of standards becomes imperative when interchangeable parts are involved. The industries of the country find it economical to cooperate with the Government in maintaining their standards of measurement.

Information concerning the standardizing activities of the several governmental agencies, and of the more important technical societies, trade associations, and consumer groups, is given in Chapters V, VI, VII, VIII, and IX.



## II. INTERNATIONAL STANDARDIZING AGENCIES

### INTERNATIONAL BUREAU OF WEIGHTS AND MEASURES

(Paris, France)

(From a memorandum received from the director)

The bureau has been engaged in the comparison of the lengths of mural base standards of various countries by means of 24-meter wires. In the course of the work, a source of error was found in that the lines of the scales attached to the wires had been read by means of magnifying glasses at the international bureau, but were sometimes being read by microscopes in national laboratories. If the lines are slightly irregular at their extremities, this may cause an appreciable constant error. For this reason two wires have been fitted with special scales in a horizontal plane such that the wires can be calibrated directly in the primary base apparatus with microscopes. These wires were first sent to Teddington and later to Poland.

Interferometric measurements have occupied much time at the bureau recently. These measurements are generally made with five or six different wave lengths of the spectrum of cadmium, mercury, neon, and krypton. The bureau can now determine a length up to 50 mm very rapidly. By combining two of these lengths it is possible to determine a decimeter length to approximately a hundredth of a micron. The progress thus realized in methods of interferometric measurements has been used both in the calibration of industrial gages and also in the furtherance of scientific research. At the present time, the lengths of quartz decimeters are determined interferometrically to a hundredth of a micron, thus enabling the bureau to determine with precision the length of this type of reference standard. Several decimeters will be made from the quartz block which the late Dr. S. W. Stratton presented to the bureau.

The bureau has been attempting for many years to produce a suitable substitute for platinum-iridium as a material for standard weights. Tantalum has been tried, but present efforts are being directed toward developing a process by which standard weights without cracks or other blemishes can be made from tungsten.

During the past year the installation of equipment for electrical testing has been completed. The bureau can now intercompare standards of the ohm and of the volt, and can compare them with the bureau's standards.

The consulting committee on electricity has chosen the title Consulting Committee on Electricity and Photometry; photometry in its international aspect is now in the domain of this committee. A study has been made of the notes published on the establishment of a photometric standard, and especially that published by the late Dr. George K. Burgess proposing a black-body radiator using molten platinum.

## INTERNATIONAL ASTRONOMICAL UNION

The fourth meeting of the general assembly of the International Astronomical Union was held at the Harvard University Observatory, Cambridge, Mass., September 2 to 9, 1932.

The following standardization actions were taken at this meeting:

The values 4,063.597, 4,071.740, and 4,260.479 Å were adopted as additional secondary standards of wave length from the iron arc spectrum. Also a group of 10 blue lines in the first spectrum of krypton was adopted as wave length standards, since it appears that the scale of these is identical with that of the primary standard to within 1 part in 50,000,000. The values of krypton standards in angstrom units are as follows: 4,273.9702, 4,282.9688, 4,318.5522, 4,319.5800, 4,362.6425, 4,376.1220, 4,399.9674, 4,453.9179, 4,463.6903, and 4,502.3546.

Boundaries of the constellations were straightened out from the North Pole to the South Pole by using in every case circles of right ascension or declination instead of the somewhat haphazard lines previously employed.

Uniform four-letter abbreviations for the constellation names were adopted, replacing the three-letter abbreviations previously agreed to, the advantage of the new method being that it suggests at once the name of the constellation.

For catalogues other than those containing precise positions of stars, the equinox of 1900 was recommended and, it was further urged, that when this date becomes too remote, a jump be made at once to 2000.

A resolution was approved looking with favor upon the adoption of a uniform set of notations covering nearly the whole field of astronomy with the proviso that such notations be made to conform with those in use in overlapping sciences—spectroscopy, for example.

Twenty-four countries now adhere to the union to cooperate in the work of facilitating the relations between astronomers of different nations where international cooperation is required and useful, and to promote the study of astronomy in all of its branches.

Prof. Frank Schlesinger, Yale University, New Haven, Conn., is now president of the union, and Prof. F. J. M. Stratton, Cambridge University, England, is general secretary.

As a rule general assemblies of the union are held at intervals of three years. The next meeting is scheduled to be held in Paris in 1935.

## INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS

Furnished by J. A. Fleming, general secretary of the American Geophysical Union, 5241 Broad Branch Road NW., Washington, D. C.

**General.**—Accounts of various activities pertaining to standards, standard instruments, and nomenclature by the International Union of Geodesy and Geophysics in geodetic and geophysical fields are given on pages 20 to 24, 36 to 40, 22 to 25, 54 to 60, and 70 to 71 of the Standards Yearbooks for 1928, 1929, 1930, 1931, and 1932, respectively.

Publications relating to the transactions, including scientific papers and reports, of the various assemblies of the union and its associations may be procured through the general secretary of the union (Brig.



H. St. J. L. Winterbotham, ordnance survey, Southampton, England), or through the secretaries of the union's seven associations, the names and addresses of whom will be found on page 70 of the Standards Yearbook for 1932.

The fifth general assembly of the International Union will be held at Lisbon, Portugal, some time in October, 1933.

**Publications.**—Since the report in the Standards Yearbook for 1932 the Association of Meteorology has published the transactions of the fourth general assembly at Stockholm in August, 1930, in one volume of 67 pages, including the report of the central office of the bureau, the agenda for the meeting, the detailed transactions of the meeting, and the resolutions adopted (both French and English texts). Among these resolutions are those bearing on pluviometric measurements and standardizations, the possibility of publishing data necessary for the calculation of the entropy of the air, the importance of defining "turbidity of the air" in a simple quantitative manner, on the establishment of an absolute pyrheliometer, on the production of a standard actinometer, on the systematic observations of showers of mud in regions where they are not infrequent, on international organization of data to determine relationships between the quantities of polar ice and seasonal weather, on the interest to meteorology of atmospherics, and on the desirability, in view of the utility of observations of air waves propagated to great distances in the study of the conditions in the upper atmosphere, of observations in the north of Scandinavia of waves proposed at the Kiruna iron mines.

**Change in Statutes.**—At the general assembly of the International Research Council, of which the union is a part, at Brussels, July 1, 1931, the title of the council was changed to International Council of Scientific Unions. New statutes were adopted under which the International Union of Geodesy and Geophysics will operate in the future. These may be summarized as follows:

1. A country can now join the council by signifying its desire to do so.
2. The unions have but to communicate their statutes in order to become adhering organizations.
3. Each union is now an adhering organization.
4. Each union is represented on the executive committee of the council by two members.
5. The president of the council is elected by the general assembly for one triennial period and is not immediately reeligible.
6. The vice presidents and the two members elected by the general assembly hold office until the second general assembly and are not then eligible for immediate reelection.
7. The president can invite any scientific man to attend the general assembly.
8. Each adhering country has one vote and each union three votes on administrative questions.
9. The subscription for each country to the International Council of Scientific Unions is now 100 gold francs and for each union not more than 1.5 per cent of its annual income.
10. A country is no longer required to adhere to the council before joining a union.

#### AMERICAN GEOPHYSICAL UNION

Furnished by J. A. Fleming, general secretary of the American Geophysical Union, 5241 Broad Branch Road NW., Washington, D. C.

The thirteenth annual meeting of the American section of the International Union of Geodesy and Geophysics, namely, the American Geophysical Union, was held in Washington April 28 and 29, 1932. The complete transactions of the general assembly of the

union and of the meetings of its seven sections were published in June, 1932, by the National Research Council in a volume of 401 pages under the title "Transactions of the American Geophysical Union, Thirteenth Annual Meeting, April 28 and 29, 1932, Washington, D. C." The activities at this meeting pertaining to standards and standard instruments are briefly abstracted below.

**General Meeting of the Union.**—Among the 10 resolutions unanimously adopted, 7 bear on matters of interest from the viewpoint of standards. The first resolution stresses the need of continuing oceanographic work without curtailment, thereby emphasizing the great value of such work as is conducted by the various bureaus of the Government, and urges that any disproportionate curtailment be avoided.

The second resolution points out the great scientific value of observations of gravity at sea in the waters of the West Indies and adjacent regions by United States Navy expeditions, and that such determinations can be made only on board a submerged submarine, and expresses the hope that such aid be continued by placing a submarine at the disposal of properly equipped observers desiring to undertake such work either in the waters near the United States or in midocean.

The third resolution points out that the determination of gravity at sea is a means of discovering geophysical and geological facts of great value and importance in ocean areas, and expresses the hope that the necessary apparatus of the multiple-pendulum type may soon be secured by some organization or institution in this country so that gravity may be determined with an accuracy approaching that attainable on land. The fourth resolution urges an increase in the number of standard time signals broadcast daily by the United States Navy. The fifth resolution urges that educational institutions provide courses in advanced meteorology. The sixth relates to Geophysical Abstracts compiled by the United States Bureau of Mines and urges that its compilation and publication be continued and extended, if possible, in view of the growth of interest in geophysics in recent years. The seventh resolution expresses appreciation of the oceanographic work of the United States Coast Guard and the hope that it will be possible for that service to make further determinations of the interchange of water between the Arctic and Atlantic Oceans in the region of the Great Bank and Davis Strait, and incidentally to make meteorological and magnetic observations.

At the general scientific session of the union a symposium on the application of geophysics to ocean basins and margins was led by Prof. Richard M. Field. Nine speakers presented papers which evoked extended discussion emphasizing the remarkable growth in the geophysical sciences in the last few years, particularly in oceanography. Problems in the study of present-day oceans and ocean basins have a direct bearing upon the solution of geological problems. The program was planned to emphasize the importance of oceanographical research in the relation of geophysical methods to marine geological problems and also the development of a reasonably sound method of attack.

At the meetings of the seven sections of the union prior to the general assembly there were presented many communications relating to standards and determinations of standards.



**Section of Geodesy.**—Eleven papers read at the meeting of the Section of Geodesy reported progress relating to the determination of gravity at Washington and in the Bahamas, on the improvement of gravity apparatus, on the geodetic control for plotting of aerial photographs and analytical methods in aerial photogrammetry, on investigation and comparison of invar tapes and precision circles, on geodetic surveys, and on lunar correlations with small changes in latitude variation.

**Section of Seismology.**—The meeting of the Section of Seismology was devoted to a symposium on the application of seismology to the study of ocean basins, and included five papers relating, respectively, to the accuracy of epicenter determinations, applications of interferometric tiltmeters in geophysical problems, relation of seismology and structural geology, and relationship between earthquakes in the North Atlantic Ocean and submarine cable breaks.

**Section of Meteorology.**—At the meeting of the Section of Meteorology, the subjects discussed in the 11 papers presented comprised the program for the Second International Polar Year and the use of polar year data in the study of atmospheric interchange, a program for the observation of weather changes during the solar eclipse of August 31, 1932, on the winds in the upper atmosphere and the winds of the Antarctic, on the determination of atmospheric turbidity and atmospheric water vapor, on the exchange of energy between ocean and atmosphere, and interrelation between air temperatures in California and ocean temperatures in the northeast Pacific, on weather charts for the northern hemisphere, and on 50 years of North American rainfall.

**Section of Terrestrial Magnetism and Electricity.**—At the meeting of the Section of Terrestrial Magnetism and Electricity, 17 progress reports on magnetic and electric work of organizations in the United States during 1931-32 were received and summarized. Most of these were of interest in their bearing on standards and their application in geophysical methods and magnetic surveys. Following the progress reports, 10 papers were presented bearing particularly on the ionization in the upper atmosphere and measurements of the heights of ionized regions, on radio transmission phenomena, on the relation of lightning discharges to changes in the electrical field of thunder storms, on slow-moving ions in the atmosphere, and on instrumental developments, including a new portable electrometer and optically compensated variometers.

**Section of Oceanography.**—At the meeting of the Section of Oceanography, standards was a subject of chief interest. Fifteen papers were presented, dealing with the penetration of light in sea water, radium content of ocean bottom sediments, temperature gradients in ocean waters, and the recommendation of a program of hydrographical observations for quantitative determination of Arctic and Atlantic Oceans interchanges. Besides these, statements were given of the progress of oceanographic work in the United States by governmental and private organizations, of the relations of oceanography and geology, and of the measurement of surface sea temperatures by bucket.

**Section of Volcanology.**—The three papers presented before the Section of Volcanology included a preliminary survey of the vol-

canological activity of Guatemala, El Savador, and Nicaragua during the first three months of 1932, experimental work on the volatility of silica with steam, and volcanologic developments in 1931-32.

**Section of Hydrology.**—In the meetings of the Section of Hydrology the reports and papers dealt to an unusual extent with matters pertaining to standards, standard methods, and standard instruments. Nearly one-third of the volume of transactions is devoted to these. The reports submitted by the chairmen of eight of the permanent committees of the section include snow hydrology, glaciers, evaporation, absorption and transpiration, run-off, underground water, stream dynamics, and chemistry of natural waters. The 21 papers presented cover a wide range in hydrology, including investigations of methods for determining permeability of water-bearing material, flood-flow phenomena, soil moisture, relation of run-off to size and character of drainage basins, velocity of flow in natural streams, fluctuations of ground-water table, hydraulic and sedimentary characteristics of rivers, formulas for predicting annual run-off, a method of computing evaporation of sea water, and problems of underground water flow in the oil industry.

#### INTERNATIONAL GEODETIC ACTIVITIES

Furnished by United States Coast and Geodetic Survey

An important international project was carried out in the West Indies during the early part of the calendar year 1932. Gravity-at-sea determinations were made at 54 points near Cuba and in the vicinity of the Bahama Islands, and 12 land stations were established on the islands themselves. This work was done under the auspices of the International Expedition to the West Indies, of which Prof. Richard M. Field, of Princeton University, is the director.

The gravity work at sea was done by the cooperation of the United States Navy, which furnished a submarine and tender with personnel, and Dr. F. A. Vening Meinesz, of Holland, who furnished the instruments and made the observations. Dr. Harry Hess, of Princeton, assisted with the observations and computations. A large number of sonic soundings were taken along the route followed by the submarine. The land determinations were made by an observer of the Coast and Geodetic Survey.

A new gravity base station was established by the Coast and Geodetic Survey in the new building of the Department of Commerce during the year. At the request of the Director of the Bureau of Standards, plans are being made by the Coast and Geodetic Survey to send an observer to Potsdam, Germany, early in 1933 to obtain an accurate connection between the world gravity base station there and the point at which the Bureau of Standards is now determining the absolute value of gravity. At the same time the new base station mentioned above will be connected with the Potsdam station.

By cooperative agreement between the Coast and Geodetic Survey and the Geodetic Survey of Canada, the triangulation net of the eastern part of Canada has been adjusted in one piece with the net in the northeastern part of the United States. The triangulation of western Canada had already been adjusted to the net of the western



half of the United States. The adjustment of the first-order triangulation of the eastern half of the United States has recently been completed and the whole first-order net of the United States and Canada is now on a coordinated basis, the North American Datum of 1927.

During the years 1900 to 1914, inclusive, there were in the United States three of the six stations of the International Latitude Service, namely, Ukiah, Calif., Cincinnati, Ohio, and Gaithersburg, Md. The International Latitude Service was created to study the movements of the earth's pole and the consequent variation of latitude. The three stations named and three others in Europe and Asia were established very nearly on the same parallel of latitude ( $39^{\circ} 08' N.$ ) in order that they might all utilize the same observing list of stars and that consequently it might be possible both to free the observed latitudes from errors in the stellar declinations and also to correct the declinations themselves. Ukiah and Gaithersburg were maintained by the International Geodetic Association; Cincinnati happened to be on the parallel of latitude and agreed to cooperate. Observations were discontinued at Gaithersburg in 1914 for reasons of economy, but astronomers and others interested felt that this left a serious gap, especially since Cincinnati and Charjui in Turkestan had discontinued their work. Efforts were accordingly made to have the Gaithersburg observatory reopened. Meanwhile, as a result of the war, the immediate direction of the various latitude observatories had been transferred from the International Geodetic Association, which had ceased to exist in its first form, to the governments of the several countries in which the latitude stations were situated. Thus the Ukiah station came under the direction of the United States Coast and Geodetic Survey and finally in 1930 funds were appropriated for the resumption of work at Gaithersburg. The funds first available were spent in reconditioning the zenith telescope used in the work, the observatory, and the observer's dwelling. Finally early in 1932 an observer, Earl L. Williams, was appointed and the first observations for the international cooperative latitude work under the new order were made on April 14, 1932. The observations are reduced under the immediate direction of Prof. H. Kimura, of Japan, who is chairman of a joint international committee on the variation of latitude. The committee is composed of astronomers, geodesists, and geophysicists.

#### INTERNATIONAL ELECTROTECHNICAL COMMISSION

(Central office of the International Electrotechnical Commission, 28 Victoria Street, Westminster, London, S. W. 1, England)

Furnished by Clayton H. Sharp, president, United States National Committee of the International Electrotechnical Commission

A plenary session of the commission was held at Oslo, Sweden, in 1930; the next meeting will be held in 1934 in Czechoslovakia. A description of the work of the commission is given on page 76 of the 1932 Standards Yearbook. The following résumé covers the work of the United States National Committee of the IEC for the current year.

The reorganization of the United States National Committee, which was approved by it in July, 1931, was consummated at a re-

organization meeting held December 1, 1931. The following officers of the committee were elected: C. O. Mailloux,<sup>1</sup> honorary president; C. H. Sharp, president; A. E. Kennelly, honorary secretary; C. R. Harte and H. S. Osborne, vice presidents; P. G. Agnew, secretary; and J. W. McNair, assistant secretary. The membership of the committee as reorganized consists of: First, members of the Electrical Standards Committee; second, members appointed by the American Society of Mechanical Engineers; third, members selected by the Electrical Standards Committee because of their experience and competency in the international aspects of electrical standardization.

The new arrangement continues to be very advantageous inasmuch as through this direct affiliation with the ESC the USNC looks to that authoritative body as a source of advice and instruction in regard to American participation in international standardization. Furthermore, its technical work is being executed, as far as possible, through the medium of existing sectional committees. Because of the official connection thereby constituted between the USNC and the American Standards Association, whereby the machinery and financial support of the ASA are available, the USNC is now able to operate more efficiently and to represent American opinion with greater authority at international meetings.

Following is a summary of the work of the advisory committees for the current year, together with a list of advisory committee projects in progress under the USNC:

**Nomenclature.**—This subject is dealt with by advisory committee No. 1, which is divided into three sections as follows:

(a) *International electrotechnical vocabulary.*—A comprehensive vocabulary in French and English is under compilation. The work will be greatly facilitated by the draft report on electrical definitions issued during September, 1932, by the sectional committee on electrical definitions under the sponsorship of the American Institute of Electrical Engineers under the procedure of the ASA.

(b) *Electrical and magnetic magnitudes and units.*—The names for the cgs units, magnetic flux, Maxwell; flux density, Gauss; magnetic field intensity, Oersted; magnetomotive force, Gilbert; adopted at the Oslo meeting in 1930, were confirmed at a meeting of the Symbols, Units, and Nomenclature Commission of the International Union of Pure and Applied Physics, held in Paris in July, 1932. This concurrence by the SUN commission brings these names for the units into a very strong position.

(c) *Letter symbols and signs for physical, mathematical, and engineering purposes.*—This committee has instituted a revision of IEC publication 27, letter symbols.

**Steam Turbines.**—The secretariat for this project which resides in the USNC has extended further time for comment on the appendix to publication 46, Steam Turbines, part 2, Rules for Acceptance Tests. This appendix when completed will contain informative material on instruments and methods of measurement. The advisory committee is also cooperating with the International Standards Association on the velocity measurements of fluids.

<sup>1</sup> Deceased, Oct. 4, 1932.



**Measuring Instruments.**—Standards for two classes each of a. c. watt-hour meters and instrument transformers were completed at the Stockholm meeting and are now in printed form as publications 43 and 44.

**Oil Switches and Circuit Breakers.**—The preliminary IEC recommendations, publication 47, covering definitions and rules for switch gear have been issued in printed form. These cover definitions and rules for operating duty; series of operations; standard series of interrupting operations; standard series of circuit making tests; recovery voltage; making, breaking, and short-time current for determining the performance of circuit breakers; power factor; terms of rating of circuit breakers.

The following are additional advisory committee projects under the USNC: Electrical machinery, symbols, hydraulic turbines, Edison screw lamp bases and sockets, aluminum, standard voltages and high voltage insulators, electric traction equipment, insulating oils, rules and regulations for overhead lines, radiocommunication, rating of rivers, shellac, terminal markings, internal-combustion engines.

International Electrotechnical Commission standards which are available in printed form are:

International symbols: Part 1, letter symbols, publication 27, December, 1920. Part 2, graphical symbols for heavy-current systems, publication 35, 1930. Part 3, graphical symbols for weak-current systems, publication 42, 1931.

International standard of resistance for copper, publication 28, March, 1925.

Rules for electrical machinery, publication 34, 1930.

Standard dimensions of bayonet lamp sockets and caps, publication 37, 1927.

Standard voltages, publication 38, 1927.

International rules for traction motors, publication 39, 1927.

Publication on the testing of hydraulic turbines, publication 41, 1928.

Recommendations for alternating-current watt-hour meters, publication 43, 1931.

Recommendations for instrument transformers, publication 44, 1931.

Publication on steam turbines: Part 1, specification, publication 45, 1931. Part 2, rules for acceptance tests, publication 46, 1931.

Definitions and rules for switch gear, publication 47, 1932.

#### INTERNATIONAL TECHNICAL CONSULTING COMMITTEE ON RADIO COMMUNICATION

This committee was organized by the International Radio Conference held in Washington in 1927. It was provided that this committee should be formed, for each meeting, of experts representing governments or radio operating companies. Its function is to advise the radio administrations of the world on technical radio problems.

The committee's first meeting was held at The Hague in 1929, and its second meeting at Copenhagen in 1931. Its conclusions were put in the form of "opinions," there being 50 opinions resulting from the two meetings. While the committee and its opinions are purely

advisory, the latter have largely been put into effect by the radio administrations of the various governments, and in particular by the Federal Radio Commission in the United States.

At the conclusion of the Copenhagen meeting, 14 questions were agreed upon as agenda for the next meeting of the C. C. I. R. These questions are:

1. Organization regulations of the C. C. I. R.
2. Participation of international organizations in the C. C. I. R.
3. Working of a mobile station accurately on the frequency of land stations.
4. Allocation of bands of frequencies.
5. Study of harmonics.
6. Reduction of electrical interference.
7. Selectivity and frequency stability of radio receivers.
8. High-frequency calling frequencies.
9. Modulated telegraph transmission.
10. Key clicks.
11. Standard frequency transmissions.
12. Measurement of noise.
13. Radiotelephony between small ships and land stations.
14. Telephony with moving trains.

As the next meeting of the International Technical Consulting Committee on Radio Communication will not be held until 1933 or later, with the International Radio Conference of Madrid intervening, it was decided to have studies of these questions made by the various nations in time to be considered at the Madrid Radio Conference which opened September 3, 1932. The study of each question was centralized or coordinated by some one government. Among the more important subjects were: No. 1, centralized by Italy; No. 4, centralized by Great Britain; and No. 6, centralized by Denmark. The United States Government contributed detailed studies on each of these questions. The results of this work will not be known until the conclusion of the Madrid Radio Conference.

#### INTERNATIONAL SCIENTIFIC RADIO UNION

The last general assembly of the union was held at Copenhagen, Denmark, in 1931. The report of that meeting, issued in 1932, reviews the state of progress in radio research in the fields of the union's several commissions, viz, radio measurements, wave propagation, atmospherics, radio cooperation, and radiophysics.

The union formulated a definite program for radio observations during the polar year, August, 1932, to August, 1933. This includes measurements of the height of the ionized layer of the atmosphere, distance ranges, and propagation across the north polar cap. The coordination of scientific radio work at laboratories throughout the world during the polar year was promoted.

A statement of the activities of the union, through national sections in several countries, is included in the 1932 Standards Yearbook, page 83.

#### INTERNATIONAL COMMISSION ON ILLUMINATION

The principal activities of the International Commission on Illumination during the past year have been (1) consideration by the several national committees of the resolutions on technical questions formulated at the session in Great Britain in 1931, (2) organization

of work in preparation for the plenary session scheduled to be held in Berlin in 1934, and (3) a special meeting on lighting problems in aviation held at Zurich, Switzerland, October 3 to 7, 1932.

A detailed report of the technical proceedings of the 1931 session is in course of publication. The central office of the commission is at the National Physical Laboratory of Great Britain; the General secretary is J. S. Preston. The secretary of the United States National Committee is G. H. Stickney, Nela Park, Cleveland, Ohio.

#### INTERNATIONAL FEDERATION OF STANDARDIZING ASSOCIATIONS

The following new technical committees have been added to the list printed in the 1932 Standards Yearbook, page 91:

ISA 30. Fluid meters.

31. Tires, rims, and tire valves.

32. Preferred numbers.

The following meetings were held in 1931: May, in Copenhagen; September, in Basle (Council ISA); and October, in Paris.

In 1932 a series of conferences was held in Milan during the end of May and the beginning of June.

#### INTERNATIONAL ELECTRICAL CONGRESS

An International Electrical Congress was held in Paris, July 5 to 12, 1932. More than 300 special reports and papers relating to electrical and allied subjects were delivered before the several sections of the congress. At the first International Electrical Congress, held in 1881, the now familiar terms, volt, ampere, and ohm, were adopted. The present congress was devoted largely to a review of progress throughout the world in the electrical fields. The papers presented represent a valuable contribution to the literature on the various subjects discussed.

Over 30 nations were represented at the sessions, and more than 1,300 delegates were at hand. The program of the meeting did not contemplate any official actions. Printed proceedings of the congress are available in several volumes.

Dr. A. E. Kennelly was in charge of the American delegation, which included also Dr. Harold Pender as secretary; Dr. H. L. Curtis, of the Bureau of Standards; Dr. V. Karapetoff; A. S. Garfield; and H. E. Shreve.

#### IMPERIAL ECONOMIC CONFERENCE

Sessions of the Imperial Economic Conference were held in Ottawa, Canada, during July and August, 1932, at which the governments of the British Empire were represented. An important action at the conference was the appointment of a special subcommittee on industrial standardization, composed of members representing Canada, United Kingdom, Australia, New Zealand, South Africa, Irish Free State, Newfoundland, India, and Southern Rhodesia. The president of the National Research Council of Canada was chairman of the subcommittee.

Informal industrial conferences were called to discuss steel, industrial chemicals, lumber, and interchangeable parts of agricultural machinery, and at which a desire was indicated to secure agree-



ment on industrial standards to as great extent as possible between industrial groups in the United Kingdom and the several Dominions. Emphasis was given to the value of industrial standardization as a means of trade promotion, and it was felt that uniform standards throughout the Empire were essential and should be promoted.

The extent to which the recommendations of the 1930 Imperial Conference had been carried out and the final recommendations made by the subcommittee were stated in the following terms:

1. Central standardizing bodies have been formed in the United Kingdom, Australia, and New Zealand. Substantial progress in this direction has also been made in Canada. In the Union of South Africa, in the Irish Free State, and in India the position is as reported in 1930. In Newfoundland no organization for industrial standardization is in existence. In Southern Rhodesia, while there is no central standardizing body, active standardization efforts are being made under the direction of the various Government departments.

2. In those parts of the Commonwealth in which central standardizing bodies exist the national governments support them by direct financial assistance.

3. In regard to the cooperation of Government purchasing agents, great progress has been made in the United Kingdom where the purchasing departments of the Government and all local authorities are increasingly adopting British standard specifications. Progress has also been made in Canada, Australia, New Zealand, and South Africa.

4. National standardizing work in the United Kingdom is stimulated on the initiative of various Government departments, with most beneficial results. In some degree this may also be said to be true in the other parts of the Commonwealth.

5. At the invitation of the Board of Trade of the United Kingdom, the British Standards Institution has taken over the work of compiling an index of industrial specifications in common use throughout the country. No steps have so far been taken in any other part of the Commonwealth.

6. With reference to the stress laid by the Imperial Conference of 1930 on the necessity for the further development of systematic and expeditious consultation and cooperation between the central standardizing bodies in the various parts of the Commonwealth, substantial progress has been made. Regarding the view of that Conference that there are many occasions when the position might be clarified and delay avoided by oral explanation, the subcommittee is impressed by the evidence it has received of the utility of the visit undertaken by the Director of the British Standards Institution to Canada, Australia, and New Zealand in 1931-32.

7. An increase in the communication of draft specifications between the standardizing bodies in the various parts of the Commonwealth has resulted in many useful suggestions in the direction of coordination being made and adopted.

8. The recommendation regarding the separation of codes (or rules) from the actual specifications themselves is being generally observed.

9. The standardization mark "British Standard" has been registered in the United Kingdom by the British Standards Institution. No corresponding action has as yet been taken in any other part of the Commonwealth, but the matter is under consideration in Australia.

10. Generally throughout the Commonwealth simplification is being promoted as part of the ordinary standardizing activities.

11. The use of national standard specifications for the supply of materials, machinery, and apparatus is on the increase. The Governments in all parts of the Commonwealth have led the way in adopting the standard specifications. In so far as consumers are concerned, it is advisable that the value of employing national specifications should be brought more prominently to their notice.

**Recommendations.**—As a result of its deliberations the subcommittee recommends that the following resolutions be submitted for adoption by the Imperial Conference:

1. The conference recommends that, with a view to assisting the coordination of the work of national standardization, the following principles, as far as practicable, be observed:



(a) That the specifications should be in accordance with the needs of industry and fulfill a generally recognized want.

(b) That the community interest of producer and consumer should be maintained throughout.

(c) That the specifications should be arrived at by general consent.

(d) That periodical review and revision should be undertaken to prevent crystallization and keep the specifications abreast of progress.

(e) That full information regarding the initiation of any specification and progress in its preparation should without delay be circulated by the originating body to the corresponding bodies in other parts of the Commonwealth.

2. Having regard to the disadvantages which are apt to occur when a statutory provision embodies a standard specification verbatim, whether in whole or in part, instead of confining itself to a reference to a national standard specification, the conference recommends that each Government of the Commonwealth in cooperation with its central standardizing body should bring under review the position with regard to such statutory provisions, in order that it may be possible to keep these standards in line with industrial and scientific progress without the necessity of fresh legislation.

3. With a view to facilitating the general adoption of standard specifications throughout the Commonwealth, the conference recommends that the Governments concerned take into favorable consideration the provision of free entry to standard specifications and other documents circulated between the central standardizing bodies.

4. In order to provide the various parts of the Commonwealth with an accurate means of exchange of color information and to secure a basic standard in trade practice, the conference recommends that each central standardizing body should at an early date consider the issue of a standard schedule of colors.

5. As an immediate step toward the promotion of intra-Commonwealth trade through the adoption of commercial standard specifications, the conference recommends that, in respect of steel, timber, industrial chemical products, and replaceable parts of agricultural implements and machinery, immediate steps be taken by the national standardizing bodies in those parts of the Commonwealth affected to secure a greater degree of uniformity in standard specifications and trade practices.

6. With a view to the employment of common standard specifications for aircraft materials and component parts, and particularly the method of testing therein specified, the conference recommends that the national standardizing bodies in those parts of the Commonwealth particularly concerned, should cooperate directly with this object in view.

7. The conference, taking note of the observation contained in the last paragraph of the Report of the Conference on Standardization accepted by the Imperial Conference of 1930, which reads as follows:

Apart from day to day consideration of matters of detail, we are impressed with the desirability of readier means of consultation on questions of policy than are afforded by the past, or by occasional conferences such as the present,

is impressed with the desirability of obviating the difficulties and delays which inevitably occur under existing conditions in conducting consultations between the central standardizing bodies in the various parts of the British Commonwealth of Nations, and the misunderstandings which occasionally arise due to the distances between the correspondents and to the subject matter of the communications.

The conference recommends that for the purpose of maintaining closer liaison in these matters the central standardizing bodies in the different parts of the Commonwealth should be authorized to call together, periodically or otherwise, representatives in their respective countries of the corresponding bodies, or persons otherwise designated for the purpose.

The conference further suggests that such an arrangement might include a provision whereby the trade commissioners maintained in different parts of the Empire by the several Commonwealth Governments should, as occasion requires, be available to act as liaison officers for this purpose. The conference considers that it should be made clear that such consultations are purely supplementary to, and not intended in any way to supplant, the method of direct communication already established between the central standardizing bodies.

INTERNATIONAL CONGRESS OF SCIENTIFIC AND APPLIED  
PHOTOGRAPHY

The eighth congress met in Dresden, Germany, during August, 1931. At this session the following work concerning standardization was done.

**Sensitometric Standardization.**—With regard to scientific sensitometry the congress unanimously accepted the following resolutions:

1. As a unit of photographic light intensity the American proposal<sup>1</sup> is accepted with the addition of the German committee that the lamp used in connection with the Davis-Gibson filter should be a straight-filament Wolfram vacuum lamp of 2,360° K. color temperature. The intensity of this lamp so filtered shall be 1 candlepower.

2. As a standard developer for scientific sensitometric purposes, the *p*-aminophenol developer according to the American proposal (at the 7th Int. Cong.) was accepted.

With regard to the standardization of sensitometry for practical purposes, the German Sensitometric Committee proposed that: (1) "A simplified, reproducible method for the numerical establishment of the sensitivity of photographic negative layers, which are used in the daylight photography of normal objects, be internationally decided," and (2), that this method have certain criteria. The following procedure was recommended in connection with these proposals: National sensitometric committees of Germany, England, France, United States, and Union of Soviet Socialist Republics, shall within six months test and come to a conclusion regarding the German proposals. These committees will then compare the results of these tests and form an international committee which shall prepare a report for the consideration of the ninth congress.

**Motion-Picture Standardization.**—With regard to the standardization of cine film and apparatus, the congress was presented with the unanimous recommendations of the Cine Standards Committee. These recommendations are concerned with the perforation pitch, the width of film sprockets between tooth centers, the over-all width of sprockets, and with film shrinkage. The Society of Motion Picture Engineers (U. S. A.) was requested to express opinions regarding standard sizes for gate openings for sound and silent film, sizes of projection lens diameters, and to specify tolerances on their standard specifications in metric units which should preferably correspond to those published in the German Industrial Standard Specifications.

Definitions of safety film and detailed procedure for testing the burning time and flash point of such film are given. It is recommended that only safety film be used in widths less than 34 mm, and that all such film be plainly marked. Furthermore, other countries are encouraged to adopt laws similar to the German "narrow film act" which prohibits the manufacture, importation, or projection of easily inflammable narrow film.

In order to avoid confusion the name of the congress was changed to "The International Congress of Scientific and Applied Photography." The next meeting will be held in 1934 at a place yet to be selected.

<sup>1</sup>This proposal includes the use of the Davis-Gibson filter and is discussed in B. S. Misc. Pub. No. 114, *Filters for the Reproduction of Sunlight and Daylight and the Determination of Color Temperature*, by Raymond Davis and K. S. Gibson, and also summarized in the report on the seventh congress given in the Standards Yearbook, 1929, p. 41.



## INTERNATIONAL CONGRESS ON LIGHT

The Second International Congress on Light met in Copenhagen, Denmark, August 15 to 18, 1932, for the presentation of reports and new data on questions relating to biological and biophysical researches made in connection with light and the therapeutic uses of light. Twenty-six countries were represented by an attendance of some 300 delegates at the meeting. The first congress was held at Paris, in 1929. The third session is scheduled to be held in 1936, in Germany.

Four principal subjects were on the program of the session: (1) How can the effect of light baths on tuberculosis be explained? (2) The basis and organization of helioclimate researches in relation to public hygiene; (3) the rôle of pigmentation in the biologic action of light and the therapeutic effect of light baths; and (4) the choice of a unit and a method of measuring ultra-violet radiation used in medicine.

Many special papers were presented in the fields of physics, biology, therapy, and biochemistry, indicating much diversity of opinions on important problems in these fields. It is anticipated, however, that many of these fundamental questions will, through international co-operation, be sufficiently clarified in advance of the next meeting to encourage definite unified action to meet future needs.

The following summarizes the recommendations of the International Committee on Measurement and Standardization:

1. That ultra-violet radiation stimuli be evaluated upon a physical (radiometric) basis in absolute units. The ultra-violet radiation from the source is to be separated into three components by means of a nonselective radiometer (thermopile) and a series of three standard filters. The specifications for these filters are provisional, and may undergo slight changes with future developments.

The Bureau of Standards is assigned the task of preparing and standardizing the filters, sets of which will be deposited at several national research laboratories. It is anticipated that these laboratories will standardize these filters for manufacturers, physicians, and meteorologists.

2. The committee recommended to physicians the use of simple methods of measurement to control the constancy of each lamp used, and indicated that an intercomparison of lamps of different types is not possible at this time.

3. Because of the complexity of the biological problems involved, which must be solved before a unit can be fixed, the definite decision of a unit of measurement for the "ultra-violet used in medicine" could not be made at the present congress. A program of cooperation between the different institutes interested in the work is proposed to furnish a basis of discussion at the next congress.

4. The committee decided to prepare and publish an actinometric bibliography of the literature of concern to biologists and physicians.

5. The recommendations of the committee will be brought to the attention of the professional journals in the field of light.

The discussion of the specification of ultra-violet dosage was continued from the 1929 meeting, but because of the newness of the subject no agreement was reached.



## INTERNATIONAL COMMISSION FOR UNIFORM METHODS OF SUGAR ANALYSIS

The eighth session of the International Commission for Uniform Methods of Sugar Analysis was held at Amsterdam, September 5 to 8, 1932, after a lapse of 20 years since the seventh congress. The first meeting of the commission was held in Hamburg in 1897.

The commission is concerned with problems of international significance pertaining to the scientific and technical aspects of the world's sugar industry, including standards, physical constants, and analytical methods.

Because of the long interim since the seventh session it was realized that reorganization of the work was required in advance of further meetings. The responsibility for this was taken by the Bureau of Standards, through the chief of its polarimetry section, and was carried out with notable success.

To provide for the proper functioning of the organization it was necessary to develop a constitution and by-laws to govern the administration of the commission. An instrument, incorporating the advance suggestions of all interests concerned, was prepared by the Bureau of Standards and adopted by the commission at its opening session.

The program of the 1932 session embraced the following technical subjects, and referees and associate referees were selected for each topic:

1. The 100° S point of the saccharimeter.
2. Values of clerget divisors for the more widely used inversion methods.
3. Conductometric determination of the ash content of raw sugars.
4. The error due to the volume of lead precipitate in testing raw sugar.
5. The determination of reducing sugars and the influence of overheating on the determination of invert sugar.
6. Refining and keeping qualities of raw cane and beet sucrose.
7. The standardization of quartz control plates.
8. The refractometric estimation of water in sugars and sugar products.
9. Colorimetry in the sugar industry.
10. The testing of molasses.
11. The determination of raffinose.
12. The marc volume estimation for the digestion process.
13. The determination of sulphur dioxide in refined sucrose.
14. Constitution and by-laws for the International Commission for Uniform Methods of Sugar Analysis.

Approximately 50 delegates were present. They represented most of the principal sugar-producing sections of the world, and included many of the principal organizations from the different countries as well as representatives from the Physikalisch-technische Reichsanstalt, the National Physical Laboratory, the Czechoslovakian Sugar Institute, the German Sugar Institute, The British Government's chemical laboratories, and industries using sugar products.

The efforts of the session were directed toward the settlement of major disagreements in the various subjects. Definite conclusions and recommendations were adopted in all the subjects on the agenda, and provision was made for research required to secure improvements in methods now regarded as unsatisfactory.

An important action was the adoption of the Bureau of Standards numerical values for the standardization of the saccharimeter and quartz control plates. The bureau's recommendation indicated an error of one-tenth of 1 per cent in all instruments on which the world's sugar supply is bought and sold.

The commission elected the following officers to carry forward the activities of the organization: Frederick J. Bates, Bureau of Standards, Washington, D. C., president; L. Eynon, London, secretary; F. Tödt, Berlin, treasurer.

The next meeting of the commission is scheduled to be held in London in 1935.

#### NEW INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS

The first meeting of the New International Association for Testing Materials was held in Zurich September 7 to 11, 1931. This organization succeeds the former International Association for Testing Materials, which held its last meeting in New York City, in 1912. The unfavorable world situation prevented the continuation of the triennial meetings of the latter association for such a long period that at an International Congress for Testing Materials, held in 1929, it seemed to be the consensus of opinion that the new international association should be organized.

The association is divided into four groups—(a) is concerned with methods; (b) nonmetallic inorganic materials; (c) organic materials; and (d) with questions of general interest.

The meeting at Zurich started and closed with a general session, the interim sessions being simultaneous meetings of the four groups at which approximately 150 technical papers were presented and discussed. These sessions, together with the excursions to points of industrial interest and the various social events generally accompanying such international meetings, resulted in a very interesting and busy week.

As its name indicates, the association will be concerned more with the properties of and test methods for materials than with the preparation of fundamental standards. Since the International Association for Testing Materials ceased its activities, other organizations have been formed which are directing their efforts to the preparation of standards.

The new international association will function between meetings through international technical committees which have been appointed to study the properties of certain materials and methods of test. These committees will report at the next meeting, which is to be held in London in 1935.

M. A. Mesnager, of Paris, who has been president since the association was organized, was succeeded in this office at the last session of the congress by Dr. W. Rosenhain, formerly of the National Physical Laboratory of England. The late Dr. George K. Burgess, then Director of the Bureau of Standards, was elected chairman of group D. Dr. M. Roš, professor at the Federal Polytechnic School, at Zurich, was continued as secretary. The office of the association will remain at Doctor Roš's address.



## INTERNATIONAL TECHNICAL COMMITTEE OF AERIAL LEGAL EXPERTS

The International Technical Committee of Aerial Legal Experts was created by a resolution adopted at the first International Conference on Private Air Law at its meetings in Paris on October 27, 1925. The purpose of the committee is to develop a comprehensive code of private air law accomplishing uniformity on this subject throughout the world. Each country subscribing to the committee and appropriating the small sum of money required for its maintenance is privileged to appoint delegates. The following designations have been made by the United States: Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, and John C. Cooper, jr., as members of the committee; George B. Logan, alternate member, and John Jay Ide, technical assistant in Europe for the National Advisory Committee for Aeronautics, as technical assistant to the American members of the committee.

The various members of the committee are assigned to places on four commissions which function under the main committee. Each of the commissions is assigned a group of subjects for consideration and its work is carried on by correspondence through a reporter assigned to the work. The secretary general of the committee is Edmond Sudre, 37 Avenue Rapp, Paris.

The commissions designated by the international committee for the purpose of making studies of the various phases of private air law, all of which deal with legal duties and responsibilities, and their assigned topics, are as follows:

**First Commission.**—(1) Nationality of aircraft; (2) aeronautical register; (3) ownership, co-ownership, construction and transfer; and (4) vested rights, mortgages, privileges, and seizure.

**Second Commission.**—(1) Category of transportation (commercial transportation, touring, etc.); (2) bill of lading; (3) liability of carrier toward consignors of goods and toward passengers; (4) jettison of cargo and general average; and (5) renting of aircraft.

**Third Commission.**—(1) Damage and liability toward third parties (landing, collision, and jettison); (2) limits of liability (contractual limitation, abandonment); and (3) insurance.

**Fourth Commission.**—(1) Legal status of commanding officer and crew; (2) accidents to the crew and insurance; (3) status of passengers; and (4) law governing acts committed on board of aircraft.

When a commission accomplishes a draft of a treaty the draft is then submitted to a meeting of a plenary session of the international committee. After this committee approves the work, the French Government is requested to call an international convention on private air law.

The First Convention on Private Air Law was held in Paris, October 27 to November 6, 1925. Forty-three nations were represented. The Second Convention on Private Air Law was held at Warsaw, October 4 to 12, 1929. Sixty-five delegates representing thirty-two States were present. This convention adopted the draft of the convention on liability of carriers toward passengers and shippers by air. A third international conference is scheduled for 1933, probably to be held in Rome.



At the plenary session of the international committee held at Budapest in 1930, the draft of a second convention dealing with the responsibility for damages caused to third parties on the ground was approved.

At the plenary session of July 21 to 23, 1932, the International Technical Committee of Aerial Legal Experts adopted a draft of a convention on the precautionary attachments of aircraft. This draft will be submitted to the Third International Conference on Private Air Law, which will probably be held during 1933.

### III. NATIONAL STANDARDIZING LABORATORIES

#### (Governmental)

##### BUREAU OF STANDARDS

(Washington, D. C., U. S. A.)

(See Chapter VI)

The primary function of the Bureau of Standards includes the development, construction, custody, and maintenance of reference and working standards, and their intercomparison, improvement, and application in science, engineering, industry, and commerce. Most of the bureau's work is accomplished through voluntary cooperation of the Federal, State, and municipal governments; scientific and professional societies; trade associations; and other organizations concerned with the bureau's research results. The extent of this cooperation is shown by the fact that approximately 150 scientific, technical, and industrial organizations have committees on which the bureau is represented; 47 advisory committees representing science and industry have been especially appointed to assist in cooperative research programs; and at the close of the past fiscal year 66 research associates, representing 28 industries and associations, were stationed at the bureau to work on research problems of general interest to the industries concerned and of public value.

##### NATIONAL PHYSICAL LABORATORY

(Teddington, England)

**Fundamental Standards.**—Work on fundamental standards of measurement in cooperation with the International Bureau of Weights and Measures and the national laboratories of France, Germany, and the United States of America has shown notable progress. The length of the meter in terms of the red-light waves of cadmium has been determined—the result agreeing closely with the classical work of Benoit, Fabry, and Perot. The international ampere has been redetermined by the silver voltameter method in Berlin jointly by representatives of the Physikalisch-Technische Reichsanstalt, the Bureau of Standards, and the National Physical Laboratory. The electromotive force of the Weston normal cell as maintained at the laboratory was found in excellent agreement with the value assigned to the cell in Washington in 1910.

Progress has been made on the electrical units in absolute measure. Using the reconditioned ampere balance, a series of satisfactory measurements was made. The absolute ohm determination by the Campbell alternating current method gave as final result: 1 international ohm = 1.00046 cgs ohms. The units of electrical capacity of the Bureau of Standards and the National Physical Laboratory were intercompared.

The work of establishing the international temperature scale was continued in the ranges of the thermocouple and optical pyrometer. The scope of this work in the highest range was extended in 1930 in order to use a black body at the melting point of platinum as a primary standard of light, and with promising outlook. Preliminary results on standards of candlepower indicate that the units of the Bureau of Standards and the National Physical Laboratory are identical within the accuracy attainable by visual methods.

In 1931 the International Commission on Illumination adopted the system of colorimetry based upon that developed in the optics division of the National Physical Laboratory.

**Tank for Ship Design Research (William Froude Laboratory).—**The new tank for experiments affecting ship design is nearly ready for operation. Previous work of this type yielded notable results. Among these may be cited the 10 per cent reduction in resistance to motion of a "good" ship form as a direct result of the work in the laboratory. The estimated annual coal savings on the ships of Great Britain and Ireland may be given as over \$20,000,000 a year. On some ships the coal consumption was reduced as much as 35 per cent. In 20 ships out of 28, improved performance netted savings ranging from 3 to 30 per cent on coal consumption. Two new barges of improved design showed 33 per cent added speed with slightly less power. Experiments were made with various types of rudder in a research on the maneuvering of ships. Measurements of wake velocities were made at sea. It was found that increase in beam and draft of coaster vessels with reduced prismatic coefficient and the substitution of small cruiser stern improved the form by as much as 8 per cent at low speeds. Other projects dealt with the backing and stopping qualities of propellers, calculation of wave resistance, study of relation between wave profile and its resistance, and the cavitation erosion of propellers.

**Heat.**—Experiments on changes in thermal and electrical conductivity of single crystals of bismuth in longitudinal and transverse magnetic fields yielded interesting results showing a close analogy between the thermal and electrical conductivity changes. Work on the specific heats of gases is in progress using the carbon tube vacuum furnace. Heat flow was studied, and a calorimeter designed for measuring the heat of formation of nitrous oxide by combustion.

The Food Investigation Board has made a study relating to the best material for wrapping meat, the thermal diffusivity of meat, effect of temperature on the spreading quality of butter, thermal properties of refrigerants, and the heat transfer between metal pipes and a stream of air, etc.

**Radiology.**—The establishment of the international unit of X-ray intensity, the Röntgen, has progressed to a point where an agreement within one-half of 1 per cent was obtained in a recent intercomparison of the Röntgen by the Bureau of Standards, the Reichsanstalt, and the National Physical Laboratory. A study is in progress on the blackening of a photographic film as a measure of X-ray output and its variation with the wave length of the X radiation. Of great interest was the fact that a decrease in hardness on heating a 6 per cent tungsten steel to 900° C. was found to be associated with



the removal of lattice distortion, and the increase in hardness at 1,250° C. was accompanied by a renewal of the lattice distortion. A high value of magnetic coercive force was found to be associated with a high degree of lattice distortion.

**Sound.**—Studies were made of improved methods of measuring sound intensity and transmission of sound through partitions, especially light panels. Aural observation was replaced by instrumental methods as being more rapid and accurate. Other problems concerned the reduction of noise in aircraft, sound output of loud speakers, including articulation tests of loud speakers for schools.

**Optics.**—Laboratory instruments were recalibrated according to the new international colorimetric system, in which all colors are now expressed by positive numbers. Optical systems were studied and a survey made of the Hilger universal interferometer as used to examine aberrations of photographic lenses. Equipment for measuring infra-red wave lengths was set up, and the sources of error in laboratory tests of solar radiometers were reduced.

**Electricity.**—The properties of insulating materials were found to limit the accuracy of measurements of self-inductance and effective resistance. A new and simpler method was devised for measuring residual inductance of four terminal resistors. In the study of the magnetic properties of iron alloys it was found that surface layers richer in iron, if not removed, affect the accuracy of magnetic measurements.

Methods of measuring power, current, and voltage under the wide ranges of modern practice are being devised.

The use of photo-electric cells in photometry was developed especially to obtain a sensitive cell-filter system closely reproducing the visibility curve of the human eye. Determinations of transmission of colored railway-signal lenses were furnished to the British Standards Institution.

**Metrology.**—An explanation is being sought for a discrepancy of 2½ parts in 1,000,000 between the measurements of 24-meter surveying wires made at the international bureau and this laboratory, two special invar wires being made for this study. After complete comparison the primary standard barometer proves to be satisfactory and the secondary standard to be within the estimated margin of error. A study of atomic repulsion in relation to the cohesive properties of solids has been published. A set of 81 gage blocks of high accuracy of finish and known stability has been prepared as a reference set and a similar set to be used as working standards.

Experiments show high stability in steel gages after special heat treatment. The standard temperature of adjustment for all industrial standards of length has been 62° F. In 1931 the British Standards Institution agreed to adopt the temperature 68° F. (20° C.) as adopted by the International Committee of Weights and Measures. Since January 1, 1931, measurements on industrial length standards have been reported at the new temperature, 68° F., unless otherwise desired. A 1-kilogram vacuum balance for comparisons of highest precision was constructed of special improved design and entirely of nonmagnetic materials. This is operable from outside the chamber. In the standardization of volumetric glassware a series of experiments was made on the variation in delivered volume with variations

in draining and delivery times. Determinations were made of the surface tension of milk.

**Engineering.**—Current projects include a study of methods of hardness testing and the behavior of materials under complex stress distribution, the resistance of metals to wear, stress-strain relationship during impact, stress distribution in reinforced concrete columns, and the elastic properties of materials for damping vibration. The making of products by cold pressing sheet metal called for tests to determine the properties of such materials. Deformation by oil pressure gave promising results. A research on the efficiency of power transmission by gears was completed. Work is in progress on the design and standardization of lifting-gear components and the causes of failure. It is intended to acquire data to predict the practical performance of a leather belt when certain simple test results are known. Experiments on single crystals of silver were made in a study of their deformation under controlled stress conditions. A study of the phenomenon of "creep" is in progress in a research on the mechanical properties of materials at high temperatures. The reliability of electric fusion welding for uniting the joints of steel-framed buildings and structures is being studied. Valuable records of wind pressures on the Severn Bridge have been obtained and analyzed. Other investigations include lubrication, wheel size, and impact, properties of concrete for road construction, and tests of carriage ventilators.

**Aerodynamics.**—The mathematics of a case of disturbed unsteady motion of a fluid was worked out, and information was secured on the nature of completely developed turbulence and of the effect of a boundary. A determination was made of the relation between heat transfer and surface friction. The hot-wire method was improved by using an interrupted spark in place of the steadily heated wire in which the image is a series of dots which can be examined stroboscopically. The interferometer was used in a study of convection currents of hot air, the motion being indicated by displacement of the fringes. Wing-nacelle interference may be deduced from airfoil theory. The effect of the body-wing interference is now being studied and work is in progress in the duplex tunnel on the development of new types of aircraft.

Safety is under investigation, and a device to represent a steady spin in a wind tunnel has been completed and is in use. "Buffetting" and the flutter of air propellers are being systematically studied. A research on Pitot tubes permits calibration of low-speed anemometers to a high degree of accuracy. A compressed-air tunnel has been built and is being calibrated. Further additions are to be made to the equipment, which will increase the scope and value of the work.

**Metallurgy.**—X-ray methods were used in a study of the physical structure of metals and alloys; for example, in seeking light on the difference in behavior between hot-rolled and cold-rolled cadmium in creep tests. New progress was made on copper-aluminum, silver-mercury, and gold-copper alloys. The preparation of single crystals of aluminum was continued and single crystals of iron were produced for research on the flow and fracture of metals under prolonged stress at high temperatures. Iron was produced with a purity of 99.985 per cent in ingots of about 5 pounds and the process is now a



routine operation. Research on the surface tension of liquid metals was completed. Useful data on the commercial heat treatment of spring steel were reported to the industry. Research on iron alloys was continued and the iron-chromium diagram was completed.

The effects of impurities in copper were studied for the British Nonferrous Metals Research Association.

**Conferences.**—A conference of engineers in touch with mechanical and general engineering problems to acquaint them with the items of research in progress, to secure suggestions as to researches needed to aid in industrial developments, and to obtain advice as to ways in which assistance and support in carrying out such researches was held by the laboratory in February, 1932. Representatives of important technical societies and institutions were present.

Various additions to the research program were proposed. Many of the investigations suggested will be given attention by those directing such programs and will either be undertaken at the National Physical Laboratory or at a laboratory doing research under one of the technical or industrial research bodies.

A laboratory conference on photo-electric cells investigated the standardization of dimensions and properties of photo-electric cells for industrial and scientific purposes and agreed that the time was ripe for standardization. A special technical committee on the subject was appointed.

#### PHYSIKALISCH-TECHNISCHE REICHSANSTALT

(Berlin-Charlottenburg, Germany)

During the year ended June 30, 1932, about 15 m<sup>3</sup> of liquid nitrogen, 1.5 m<sup>3</sup> of liquid hydrogen, and about 50 liters of liquid helium were produced, partly for investigations of the Reichsanstalt and in part for other physical institutes.

The investigations on superconductivity of alloys and compounds was continued. Of the superconducting alloys investigated, alloy series Pb-Bi and Pb-Tl are to be mentioned. The measurements of compounds showed that not only sulphides, carbides, and nitrides become in part superconducting, but also the silicides and borides in part. An investigation of lead showed without question that with the advent of superconductivity not only the additional resistance due to impurities but also the resistance due to temperature disappears.

Work was carried out on the electrical conductivity of copper-gold alloys, on a test of the Born-Franck theory of adsorption catalysis and on the transformation of ortho into para hydrogen at the temperature of solid hydrogen.

From measurements of the magnetic moment of the potassium and lithium atoms it was concluded that the magnetic nuclear moment of the lithium atom is in any case smaller than one-tenth of the Bohr magneton.

Investigations on the physical and chemical properties of rhenium and its compounds were continued; many minerals and meteorites were analyzed for improving the data concerning the absolute amounts of the chemical elements in existence; and the metals plat-



inum, palladium, columbium, tantalum, gallium, and rhenium of great purity were produced in large amounts for physical purposes.

The effect of various frequencies of radiation upon the form of the photographic density curve and the magnitude of the latent image was studied. Investigations were begun on the preparative separation of isotopes. The effect of supersonant waves upon some chemical reactions was measured.

**Weights and Measures.**—Many pieces of measuring equipment were tested and certified. For the tests of the Jaderin wires the 4-meter standard of invar  $J_4$  and the tape-measuring standard of invar  $B_{30}$  were repeatedly determined. The divergence of the new values compared with the old is very slight.

Measurement of standard gages of 100, 200, 300, 400, and 500 millimeters in terms of light wave lengths was continued. The measurement was made with vacuum wave lengths, while the end gages themselves were in air. The vacuum fraction of the end measures is the difference between the fraction of the end mass in actual air and the fraction of a vacuum chamber of exactly equal length. This last fraction was calculated for the end gage length from the simultaneous observations of the vacuum chambers of 600, 500, and 100 millimeters in length. The determination of the order of interference is carried out with all the cadmium lines, and for the final measurements only the red cadmium or krypton lines are used. The investigations on the exact determination of the refractive index of air were continued with chambers of path difference of 1 and 2 meters. Furthermore air of the most varied meteorological composition was compared in white light with air freed of water vapor and carbon dioxide compressed in a bomb at the same pressure and the same temperature. The measurements show beyond doubt that air free of water vapor and carbon dioxide shows, entirely independent of the meteorological conditions, no variations whatsoever. Further it developed that a closed volume of air between 17° and 25° C. has the same refractive index. The index is entirely dependent on the density of the air and determinable from the pressure and temperature according to well-known formulas.

In the field of length-measuring devices, in addition to current-type tests, special fabric-testing machines of various kinds for velvet, plush, and velvet-like textiles were tested with favorable results. Paper measuring tapes permitting length to be readily measured, heretofore accepted for textiles, were admitted also for the cable industry.

Distance measuring machines for service in connection with the new regulation for taxing power vehicles were tested for accuracy and reliability. It was established that the distances were correct to within 2 per cent, independently of the road and weather conditions and of the speed.

Comprehensive tests of leather-measuring machines were made, chiefly for industrial purposes. There was also admitted for sample tests a polar planimeter with a large measuring barrel which had, next to the principal metric divisions, also secondary divisions in the English square-foot measure.

The regulations for the calibration of paper-tape measures as well as directions for the testing of length and area measuring machines were published.

A large number of liquid measures were admitted for calibration. These were principally for motor fuels and for milk. New regulations for the testing of measuring installations having flow meters for gasoline were prepared.

Applications for admitting new kinds of metal containers have increased.

A set-up for testing metal containers relative to internal pressure was built and has proved trustworthy.

Standard weights for German and foreign jurisdictions were tested, in part with determination of the volume according to the method of water weighing.

Investigations were undertaken on a new grain tester which differs from the present admissible construction. It possesses a conical spreader similar to the 20-liter tester. The investigation of national grain testers was continued especially relative to the standard of the Reichsanstalt and relative to the variations of the grain. To attain better agreement of the certifiable testers with one another, the regulations concerning carrying out and dimensions were made more exacting.

New directions materially enlarged over those of 1911 were prepared for the testing of trade scales. Many forms of scales, especially with tilting weight arrangement, were finally admitted to certification test. The pictorial representation and descriptive details pertaining thereto were correspondingly augmented. There was turned over to the testing service for its use a new system for testing scales in which the weighing is done by beams having a sliding poise. Furthermore, there were investigated two systems of measuring for the testing of track scales with continuous rails.

The standardization in scale construction was further advanced by the Technical Standards Committee through the issuance of four DIN sheets. The instructions for checking automatic beam scales were further developed. Type tests for scales for automatic weighing of cargo material of various kinds were carried out.

The instructions concerning the testing of hydrometers and medical syringes were revised for chemical measuring apparatus, and an instruction is in preparation.

The table relating to the dependence of density (degrees of alcohol) percentage content and temperature of high-percentage alcohol-water mixtures were extended so that the tables increased by  $0.2^{\circ}$  C. of temperature. The investigations on the determination of density and of the refractive index of sea water were continued. An apparatus was made to permit the simultaneous testing of 25 samples of sea water. Besides the current type tests, preliminary work for the production of an installation for testing large gas meters was advanced.

The regulations for calibration were extended. The question of an accurate testing method for experimental gas meters which serve for the determination of the calorific value of fuel gas was further investigated.



**Electricity and Magnetism.**—An investigation in the field of absolute units, namely, an absolute current measurement by the aid of the current balance has been undertaken. The construction of the balance for which in many respects the model of the Bureau of Standards served as pattern is being carried out. Since this work is now nearly completed, measurements will be started immediately and first the radii of the spools will be determined by magnetic methods.

The piezo-electrical measuring method was applied for tracing abrupt changes in velocity of rotating shafts. The apparatus depends upon the centrifugal action of spring-supported masses. The magnitude of the measured velocity changes was of the order of 1 per cent. The tube voltmeter for measuring piezo-electric charges was so changed that instead of the galvanometer oscillographs a cathode ray oscillograph can be used for tracing.

For measurement purposes an automatically starting tuning fork buzzer was built of 50 hertz with a thyatron tube in relaxation oscillation connection which at the same time serves as a light source.

**Heat and Pressure.**—With the aid of a static method for precise vapor-pressure measurements above room temperature which was specially developed as a vapor pressure thermometer with water filling, the 100° C. point of the temperature scale could be reproduced with an accuracy of  $\pm 0.001^\circ$  and used in the calibration of temperature-measuring devices.

A comparison of this with the customary dynamic method (Rudberg apparatus) indicates that the latter shows, in general, two or three times larger variations, and in addition is not free of systematic errors of the same magnitude, so that the 100° C. points of thermometers measured by this method may be in error by a few thousandths of a degree. With the same static method the variation, with pressure, of the saturation temperature of water in the region of 100° C. was redetermined with an accuracy of  $\pm 0.001^\circ$ . As a result it was found that previously used vapor-pressure tables based on older and less accurate measurements show differences of a few thousandths of a degree below 760 mm Hg (for example,  $0.005^\circ$  at 700 mm Hg). These differences can occasion appreciable errors, particularly in dynamic boiling-point determinations.

In continuing earlier measurements the vapor-pressure curves of several gases in the neighborhood of atmospheric pressure were determined with the helium gas thermometer in combination with platinum resistance thermometers; and from these observations the normal boiling points (at a pressure of 760 mm Hg) were interpolated. This gave, expressed on the thermodynamic scale, the following values:

	C.
Standard boiling point of nitrogen.....	—195.814
Standard boiling point of carbon monoxide.....	—191.484
Standard boiling point of oxygen.....	—182.963
Standard sublimation point of carbon dioxide.....	—78.471

The vapor-pressure curve of xenon was observed between 580 and 800 mm Hg. The normal boiling point lies on the thermodynamic temperature scale at  $-108.02^\circ$  C. The triple point was found at  $-111.85^\circ$  C. at a pressure of 606.2 mm Hg. For the measurement



of the melting point of platinum the Bureau of Standards method was essentially adopted, in which the metal in a thorium crucible is melted by inductive heating and the radiation coming from an immersed hollow cavity is measured optically.

According to the method described last year, which is based on the adsorption of hydrogen on carbon (charcoal), a thermostat was constructed in which one can, with the aid of liquid air and avoiding high pressure, produce any temperature between 33° and 120° K. In this thermostat the following fixed points of the temperature scale were determined:

	° K.
Melting point of CO-----	68.56
Melting point of N <sub>2</sub> -----	63.09
Crystal transformation point of CO-----	61.68
Melting point of O <sub>2</sub> -----	54.24
Crystal transformation point, O <sub>2</sub> -----	43.6

These fixed points do not yield the same constancy of temperature. The transition points are fixed points only with rising temperature, while with decreasing temperature they lie, in general, somewhat lower.

A number of platinum resistance thermometers were compared with the helium gas thermometer, both at a series of fixed points and at intermediate temperatures. The result of the measurements shows that the platinum resistance thermometer which meets the internationally accepted specification

$$(\alpha \times 10^6 \geq 3,900; R_t/R_0 \text{ at the, } O_2 \cdot \leq 0.250)$$

reproduces the legal temperature scale between 0° and -183°, and is accurately reproducible within 0.01°.

The temperatures calculated according to the established legal scale for such thermometers lie lower than those of the thermodynamic scale throughout the observed temperature and reach the maximum departure, 0.04° at about -80°.

Platinum resistance thermometers of various purity grades were compared with the helium thermometer in the range of boiling nitrogen and boiling hydrogen at a large number of points. Comprehensive attempts to present the experimental data in analytical form led to the conclusion that the relation

$$R_t/R_0 = a + D(100/T)[b \times T + cT^2] + D(230/T)[d + eT - cT^2]$$

in which  $D(100/T)$  and  $D(230/T)$  denote the well known Debye function, is best adapted to reproduce the experimental values up to this time. The actual departures amount to only a few hundredths of a degree.

Comparative measurements are still being made of strip lamps intended for the international interchange of verified lamps. In this way it is intended to extend the results of measurements obtained in the Physikalisch-Technische Reichsanstalt and already used in the various national laboratories for the comparison of scales. In particular, the question of the constancy of the lamps with time is yet to be cleared up by repeated references to the fixed temperature points.

The extension of pyrometric measurements outside the range of visible light has been advanced through the assembling of a photo-

electric measuring device. Its principle purpose is carrying out of measurements of temperature radiation of various radiators and comparing with black body radiation. As such serves a black body cavity built in a tungsten resistance furnace and easily operated to about 2,500° C.

To prepare for the international unification of viscosity values, measurements were carried out on oils of the Ecole Supérieure du Pétrole in Strassburg as earlier on samples of mineral oil from the Bureau of Standards. At present, a viscosimeter is being tested at the Reichsanstalt which is then to be sent to the Bureau of Standards and to the National Physical Laboratory for comparative measurements.

For the open cup flash point test, within Germany, a self-contained apparatus with specifications was established with the cooperation by Committee IX of the German Society for Testing Materials.

Optics.—The work on the Warburg unit of light extended on the one hand to perfecting a high frequency heated black body radiator, and on the other hand to the application for comparison purposes of the newer photoelectric cell types, radiation thermo elements, and recording methods.

#### LABORATOIRE D'ESSAIS

(Mécaniques, Physiques, Chimiques et de Machines)

(Paris, France)

(Du Conservatoire National des Arts et Métiers)

The Laboratoire d'Essais is located in the Conservatoire National des Arts et Métiers, at Paris, and has a branch at Colombes (Seine) in the northwest part of the city where is installed the service of chemical testing. It is under the Under-Secretary on the State of Technical Education, under the authority of the Minister of National Education. Its activities are controlled by a Technical Commission and 23 members comprising representatives of the Academy of Sciences and of Industry. It is the national testing laboratory for France, as far as relates to various materials and machines (electrical machines excepted). It has a personnel of 204, and there are six technical services, namely, physical testing, verification of measuring instruments, metals, structural materials, machines, and chemistry.

During the fiscal year April 1, 1931, to March 31, 1932, the laboratory received 4,202 requests for tests, distributed as follows: 596 for physical tests, 188 for testing measuring instruments, 1,044 for tests of metals, 952 for testing materials of construction, 130 for tests of machines, 1,292 for chemical tests.

Physical Tests.—Apparatus for determining the coefficient of heat conductivity of materials which conduct heat poorly have been grouped in a new laboratory room. This important installation comprises six equipments for electrical heating and for cooling by the circulation of water. The electrical measurements have been carried out on a central switchboard bearing especially a precision potentiometer to determine the temperature of the faces of the test slabs.

Relative to the study of noises the portable measuring apparatus called "noise meter" by its author, M. J. F. Cellerier, Director of



the Laboratory, has been frequently used, notably in determining the sound intensity of various mufflers for motorcycles and for marine motors of the "outboard" type in the contest of silencers organized by the French Touring Club and of the Motorcycle Club of France in collaboration with the Technical Commission of the Automobile Club of France.

The equipment of the laboratory, described last year, for determining the coefficient of transmission of sounds through various materials has been used for a considerable number of materials called "insulators against noises" which have been supplied by the various manufacturers apropos of a consultation arranged on the subject by the Touring Club of France in its campaign against noise. Interesting results have been obtained.

A radiographic installation intended for the spectrographic study of metals and of crystalline materials has been set up. The current is furnished by a rotary convertor of 15 amperes at 220 volts with a revolving contact transformer of 3 kw, giving 50 milliamperes at a maximum tension of 112,000 volts.

Finally, we may again mention the study of a thermoelectric sounding device permitting the rapid precise measurement of the temperature of the water of lakes up to a depth of 150 meters. This apparatus is now under construction in the shop of the laboratory.

**Verification of Measuring Instruments.**—This service makes verifications of two different kinds—one class is optional and relates to various thermometers, heavy liquids of all kinds, ebulliscopes, glass volumetric glassware, etc.; the other class, legal verifications, quite the most numerous, comprising the verifications required by law (clinical thermometers, alcoholometers, densimeters, and thermometers accompanying the latter instruments). The laboratory has verified in the year 1,228,447 clinical thermometers, nearly all of French manufacture.

**Tests of Metals.**—Studies have been undertaken on the corrosion of saccharoidal marbles, and of stones from historical structures. The photomicrographs made of thin cut specimens reveal the process of change of the mineralogical constituents. In evaporating and filtering upon porous collodion distilled water or the reactive diluents in which the specimens have been kept, it has been possible to collect the products of disaggregation and to identify them either in the form of crystal structure (calcium sulphate, etc.), or by microchemical means.

Particular researches have permitted the determination of the age of origin of a bar threaded at its extremities and provided with a nut which has been taken from the wreckage of a ship sunk in the Canadian lakes. This bar appeared to be a tirefond or a nail of the boat *The Griffon*, of Marquis de la Salle, which was lost in September, 1679.

We may mention, among others, the study of crystalline powders by a polarizing microscope which has a special device permitting the examination by transparency in a fine window or through an orifice pierced in Dutch gold; on the precision of results obtained in the usual mechanical tests (requested by the French Standards Association); on the subject of standardizing mechanical tests of



metals; the mechanical study of buttresses and of pieces taken from a bridge which underwent a serious accident, with a view to determining the causes; study of the compression of special shock absorbers of profiled elements and of tubes filled with cement; the study of modes of attack suitable to disclose, in the course of micrographic examination, the distribution of sulphur and phosphorus; examination of tubes corroded or having served for chemical syntheses, with photographs of the decarburized or oxidized zones.

The laboratory has made two equipments with their accessories for tests of flanging of sheet metal as well as a machine for testing metallic specimens by repeated impacts.

**Tests of Structural Materials.**—The service of materials of construction has continued the researches undertaken in preceding years. It has been able thus to complete two pieces of apparatus constructed by the efforts of the service of shops of the Laboratoire d'Essais and having for its purpose to make tests of resistance on paints and varnishes, on the one hand to a jet of sand and on the other hand to the action of certain liquids atomized to a state of mist or fog (see water, dilute acids, etc.).

In the laboratory's collaboration with the service of physical tests in carrying out experiments requested by the Touring Club of France in the "campaign against noise" apropos of materials described as "insulating against noise," a study was made of various other important properties for construction, such as hygroscopicity, porosity, inflammability, combustibility, and mechanical resistance of these materials.

On request of the Service of Architecture of Historical Structures and on account of the Administration of the Fine Arts, the laboratory undertook an important program of experiments with a view to studying means of preserving the stones of structures and protecting them from the deterioration caused by the mild but continuous action of various natural and artificial agencies of destruction, some physical, such as heat, cold, humidity, etc.; others chemical, such as gas and acid fumes of which the atmospheres of cities and industrial groups contain more or less large proportions. These experiments, including physical, mechanical, and chemical studies (the latter effected in collaboration with the Service of Chemical Tests), have been carried out on a considerable number of specimens of stones set aside by architects on different structures or monuments. These specimens were given comparative tests on the one hand in the natural state, and on the other hand after preliminary treatment by several processes recommended for protecting stones—the use of silicification and fluoridation.

**Tests of Machines.**—This service has made a complete study of four boilers of different types, for each of which was determined the curve of thermal output as a function of the rate of heat evolution, the thermal balance, etc. Besides, seven radiators for heating have been tested, and a complete curve of the coefficient  $K$  has been established for each of them.

The laboratory rendered its experimental collaboration to an extended study made of certain lubricants on new types of belting, textile, rubber, multiple trapezoidal belts. In still another field, a

series of tests were completed to show the influence of the introduction of lead in friction materials.

**Chemical Tests.**—A very modern installation of a gas calorimeter has been set up in the Service of Chemical Tests, with the assistance of a large gas company, especially with a view to checking the heating power of the gas of a large city. On request of the Service of Surveillance of Water in the City of Paris, an important study of the question of back flow of polluted waters of bath tubs, wash bowls, wash stands fed from the base to the pipes for supplying drinking water has been conducted. It has examined in this connection a number of devices designed to avoid this serious inconvenience, of which several have given entire satisfaction.

It has entered upon very interesting experiments on the protection of electrical apparatus and especially of lighting apparatus intended for industrial localities subject to gas or inflammable vapors. Certain arrangements tested were shown to be completely efficacious even in the case of arcing and in thunderstorm.

A study equally important was undertaken with the aid of the Bourget Aërodrome on the variation in the inflammability point of oils, in terms of atmospheric pressure, in view of the establishment of correction tables put out by the industry, and which have now become a source of error.

The Service of Chemical Tests has undertaken systematic study of methods of analysis of structural materials and of combustibles with a view to substituting for obsolete methods still in general use methods more rational and better meeting the present exigencies of industry and of commerce.

**Standardization.**—The laboratory has continued to give its collaboration to various standardization enterprises. It is thus that besides studies necessitated by the standardization of industrial zinc, and of coals, the laboratory has participated in the activities of the committee on oils of the Union of Syndicates of Electricity, of the French Association on Standardization (Commission on Lubricating Oils, Commission on Chemical Analysis, etc.).

**Congresses.**—The laboratory has participated in some 13 congresses on subjects within its field, mostly international.

#### LABORATOIRE CENTRAL D'ÉLECTRICITÉ

(Paris, France)

**Researches on the Electrical Units.**—Conformably to the decisions of the Advisory Committee on Electricity of the International Committee on Weights and Measures the Laboratoire Central d'Électricité has undertaken the determination of the electromotive force of the standard cadmium cell using the silver-voltameter method. This determination was to be finished by the end of 1932.

The laboratory has likewise undertaken the construction of a standard of inductance, the realization of which will probably be obtained in the course of 1933.

This standard of inductance will be utilized especially for a determination of the ohm in absolute measure as well as for a determination of the electromotive force of the standard cadmium cell in



semiabsolute volts, a work executed in collaboration with the research laboratory of the Faculty of Sciences of the University of Paris. Standard cells have been exchanged with various foreign national laboratories.

**Researches on Photometric Standards.**—New standards of luminous flux have been constructed. The realization of the standards is based upon a new procedure for measurement, using photo-electric cells. This study was necessitated by the differences found between measurements of luminous flux in France and those made in other countries.

**Standardization.**—On request of the Ministry of Public Works, the laboratory has completed the researches necessary for the formulation of a regulation having for its object the standardization of lamps for automobile headlights in France.

#### NATIONAL RESEARCH COUNCIL

(Ottawa, Canada)

By act of parliament, the National Research Council of Canada has been given the following responsibilities in the field of standardization:

The investigation and determination of standards and methods of measurements, including length, volume, weight, mass, capacity, time, heat, light, electricity, magnetism, and other forms of energy; and the determination of physical constants and the fundamental properties of matter.

The standardization and certification of the scientific and technical apparatus and instruments for the Government service and for use in the industries of Canada; and the determination of the standards of quality of the materials used in the construction of public works and of the supplies used in the various branches of the Government service.

The investigation and standardization, at the request of any of the industries of Canada, of the materials which are or may be used in, or of the products of, the industries making such a request.

During the past year, considerable attention has been given to the development and extension of standardization activities in Canada. Early in the spring C. le Maistre, C. B. E., Director of the British Standards Institution, London, England, crossed Canada in the course of a visit to all the Dominions of the British Commonwealth. At a conference in which Mr. le Maistre, the National Research Council, and the Canadian Engineering Standards Association participated, an exchange of views took place, especially with regard to:

(a) The possibility of some development of the standards machinery in Canada to accord with that of Great Britain.

(b) The adoption of certain specific common standards for commodities that are sold freely between the two countries.

(c) The advisability of purchasing by standard specifications rather than by trade name.

On July 15, a meeting of a special committee on standardization, created by the National Research Council, discussed the Canadian situation and recommended as follows:

(a) That the work of the Canadian Engineering Standards Association, which receives financial support from the council, should continue on its present basis.

(b) That the main committee of that association continue to act as an Associate Committee on Engineering Standards of the council.



(c) That the council be left entirely free to organize other fields of standardization under committees or associations similar to the Canadian Engineering Standards Association.

This report is being presented to the National Research Council for consideration and action.

During July and August a subcommittee of the Imperial Economic Conference considered industrial standardization, under the chairmanship of Dr. H. M. Tory, president of the National Research Council of Canada. The report of this subcommittee, adopted later by the conference, emphasized the necessity of the judicious development of national standard specifications and the importance of buying on nationally recognized specifications as safeguarding purchasing and insuring quality and performance. It welcomed the advance being made in the various parts of the Commonwealth in the coordination of industrial standardizing activities into central national bodies, representative of all parties concerned, and it urged that the central standardizing body in each part of the Commonwealth should be accorded active support by the Government, by way of financial and technical assistance and by the cooperation of the Government purchasing departments and otherwise.

It reaffirmed that "The development of standardization in the various parts of the Empire upon the basis of close cooperation in establishing uniform standardizing specifications facilitates Empire trade definitely and effectively."

(A summary of the Imperial Economic Conference and the recommendations of the subcommittee of the conference on industrial standardization is given in Chapter II.)

During the year the Associate Committee of Chemists of the National Research Council considered standardization of chemicals and appointed a subcommittee to carry the investigation further. Under the direction of the Associate Committee on Asbestos an extensive series of tests has been carried out in the division of chemistry, National Research Council Laboratories, and in the factories on the reliability of the testing machines now used by both producers and buyers of asbestos and on the factors which influence the results. It is expected that this work will shortly lead to satisfactory standardization of the testing.

Work under the auspices of the Associate Committee on Coal Classification and Analysis which brings a number of interested organizations and individuals together and which at frequent intervals meets with the similar committee in the United States, has continued and it is now expected that a tentative classification of Canadian coals will be available within two years. Considerable laboratory work is being done in this connection.

The Associate Committee on Electrical Measuring Instruments, similarly organized, has been considering methods of measuring power and billing with a view to possible simplification. A study has been made of tolerances permitted in types of electrical meters.

During the summer of 1932 the National Research Council's laboratories moved into new and spacious quarters, construction of which commenced in 1930. The new building, rectangular in shape, is 418 feet long, 176 feet deep, 4 stories high, and severely classic in style of architecture. Included in the building are library accommoda-

tion for 400,000 volumes, an assembly hall with a seating capacity of 300, and two exhibition halls sunk beneath the two interior courts and space for an engineering laboratory of approximately 12,000 square feet and extending through two floors of the building. Similarly designed space is provided for a high-voltage electricity laboratory.

At present the laboratory is functioning through four divisions—biology and agriculture, chemistry, physics and engineering, and research information.

**Agriculture.**—Until the opening of the new building the division of biology and agriculture was developed in association with the University of Alberta. The program of research contemplated has arisen, for the most part, from the agricultural investigations which the National Research Council has been encouraging or conducting in recent years through associate committees on such subjects as field crop diseases, principally grain rust; grain, including the drying of grain, the development of drought resistant grain; weed control, etc.

**Wheat Milling and Baking.**—The estimation of the quality of wheat, both of new varieties produced by plant breeders or introduced from abroad, and of the crop produced from year to year in various parts of the country, depends upon experimental milling and baking tests. The problem of standardizing the test methods is receiving further study, with the object of mechanizing it as completely as possible, so that results may be reproducible in different laboratories. Methods for estimating the quality of wheat with very small samples are also being further investigated, with a view to facilitating the work of plant breeders in testing new hybrids promptly.

**Plant Growth Under Controlled Conditions.**—Apparatus and methods are being developed for growing plants under conditions as completely controlled as possible. It is planned to investigate the effect of light, temperature, and humidity as factors influencing the results obtained in various agricultural experiments; for example, in the use of chemicals as weed killers. The objective is to define standard conditions for such experiments.

**Miscellaneous Agricultural Researches.**—A study of chemical substances in the wheat plant which may be connected with resistance to rust and other diseases has been under way for some years. A new research has been started on factors producing partial sterility in cereal crops. Statistical investigations of the relation between climatic factors and the growth and yield of cereal crops are also under way.

**Asbestos.**—In conjunction with the asbestos industry work has been carried out on the grading of asbestos fiber by the Quebec standard testing machine, and it is hoped that it will shortly be possible to issue new specifications for the construction and operation of the machine. Work is also in progress on (a) the possibility of using apparent density as an aid in grading asbestos, (b) special grading tests for asbestos cement stock, (c) the use of perforated plates in grading asbestos.

**Detergency.**—A quantitative laboratory method of measuring detergent action, by means of photometric measurements on standard soiled cloth, has been developed. The correlation of the data ob-



tained by this method with results of washing tests in power laundries is now being studied.

**Honey.**—The refractometric method of determining the moisture content of honey has been put on a satisfactory basis and appropriate tables worked out and published. The use of viscometric measurements of honey, by the falling sphere method, has been studied and found to be satisfactory. Tables for temperature corrections have been issued.

**Colloids.**—A study of the structural viscosity of lyophilic sols has been made and is in course of publication in the Canadian Journal of Research. Studies, also to be published, have been made on the theory of tanning.

**Distillation.**—Following the publication of a theoretical paper on the principles of fractional distillation, laboratory studies on the subject are being made, one of the liquids which is being subjected to fractional distillation in a column of new design being naphtha from Turner Valley, Alberta.

**Leather.**—Among other matters which are being studied are: (a) The electrical determination of the moisture content of leather and (b) the measurement of the pH of tan liquors.

**Miscellaneous Chemical Matters.**—Work on most of the subjects mentioned in the Yearbook for 1932 has been continued. Other subjects on which work has been undertaken and in some cases completed are: (a) The spontaneous combustion of binder twine, (b) the plasticity of lime, (c) homespun fabrics, (d) relation of the weave of fabrics to their laundering qualities, and (e) influence of oils on the weathering of canvass.

**Aeronautics.**—While the laboratories have been in operation throughout the year, using in certain cases improvised and temporary equipment, permanent equipment has been in process of design, construction, and installation. The latter includes the wind-tunnel balances, wind-tunnel automatic control, model testing basin, measuring and recording instruments, and automatic speed-control gear and apparatus and instruments in connection with the engine testing laboratory. Further, the laboratory for the testing of aircraft and allied instruments is being moved to the laboratory annex.

The work done during the past year, in addition to calibration and adjustment of the equipment has included wind-tunnel studies of aircraft skis, railroad locomotive and motor cars, tests of aircraft floats in the model testing basin, engine type tests, tests of aircraft engine fuels, oils, and accessories, and calibration and adjustment of aircraft and allied instruments.

**Oil Burner Testing Facilities.**—Equipment has been installed and is now undergoing trials for the testing of domestic oil burners for fire hazard.

**Radio.**—The necessary apparatus to form a radio standardizing and frequency standard, which can measure and fix frequencies with a precision better than 1 part in 1,000,000 has been set up. A complete investigation of radio atmospherics throughout Canada is contemplated. At the time of the total solar eclipse of August 31, the laboratories conducted investigations upon the effects of the eclipse on the Kennelly-Heaviside layers which, with the results of other



investigations that were coordinated under the auspices of the National Research Council's Associate Committee on Radio Research, indicated distinct losses in ionization in both reflecting layers, *E* and *F* regions, during period of the optical eclipse. All the results obtained indicated no corpuscular eclipse.

**Heat.**—A hot place apparatus for the testing of fiber-board insulation has been installed with the primary object of ascertaining the cause of the inconsistency in results obtained by different investigators on insulating wall board. It is found that the hot plate is not an ideal apparatus for testing the thermal conductivity of fiber wall boards in the commercial or undried state, in view of the fact that moisture can migrate during the test from the hot side of the sample to the cold side. The conductivity of a board with a fairly high moisture content was found to decrease very appreciably during a long period of testing. The work indicates that the conductivity-density relation is essentially linear, but should be represented as a band rather than a line to allow for the effect of the structure of the board on the conductivity. A new investigation is about to begin on the testing of Canadian made bricks and furnace linings for heat insulation at very high temperatures. An apparatus necessary for the precise standardization of temperatures by electrical methods is being assembled.

**Radiology.**—The laboratory undertakes the calibration of radium preparations in terms of the national standards. Preparation is being made for the calibration of radiology measuring instruments, and research on their development. Apparatus is being constructed for handling radon, and a 220,000 volt X-ray equipment is nearly completed. The laboratory is equipped for X-ray crystallography.

**Optics.**—Steps have been taken to preserve the international candle. The Bureau of Standards and the National Physical Laboratory have kindly made the council a gift of four groups of lamps similar to their "primary" standards. Apparatus for the calibration of lamps has been provided. Apparatus is available also for spectroscopic analysis and the measurement of light transmitted by transparent and translucent substances at various wave lengths. A precision optical pyrometer is in the course of construction. Apparatus is also being prepared for standardization work in colorimetry, refractometry, color temperature, and reflectivity measurements.

**Electrical Standardization at Direct and Commercial Frequency Currents.**—The council is in a position to carry out standardization work on voltage, current, frequency, power (except small power, low-power factor) in the direct current and commercial frequency ranges. All meters and apparatus used in Canada to measure electricity for the purpose of making a charge must be of a type that has secured the approval of the National Research Council. The regulations governing watt-hour and ampere-hour meters are now completed and await formal approval, as to regulations which have been drafted for block interval and demand meters. Regulations governing instantaneous graphic demand meters and instrument transformers are in course of preparation.

**Gas Meters.**—Work is being undertaken to lay down definitions and units for gas measurement and also regulations for the approval of types of gas meters used in Canada for the purchase and sale of gas.

**Metrology.**—Two new laboratory standard 1-meter rules of 43 per cent nickel-iron alloy were secured to replace the pure nickel and the 42 per cent nickel-iron rules which had formerly served as reference standards for the international meter. In addition, a "Fixinvar" rule was acquired and all three were compared with the international standards at Sevres, France.

**Electrostatic Voltmeter.**—For the measurement of voltages up to 100,000 an electrostatic voltmeter was designed and constructed which appears to have several advantages over other existing meters.

**Ultrasonics.**—A series of experiments has been undertaken with vibrating rods and disks, in order that the complicated vibrations which occur in these bodies may be more fully understood. The importance of this work lies in its relation to radio-frequency standardizing apparatus, since in such apparatus a mechanically oscillating bar or disk determines the stability and precision of the electrical frequency.

**Electrical (General).**—On account of the frequency limitation of the ordinary sweep circuit used with the low-voltage cathode-ray oscillograph tube, a new circuit was developed for use in the analysis of higher-frequency alternating voltages and currents. This circuit has been employed to generate saw-tooth waves at frequencies up to 50,000 cycles per second, and can probably be made to work at higher frequencies if necessary.

#### ELECTROTECHNICAL LABORATORY

(Tokyo, Japan)

The laboratory is attached to the Office of the Ministry of Communications and the director is Dr. K. Takatsu. The work of the laboratory is carried on in five sections—standards and measuring instruments, telephone and telegraph, electrotechnics, radio, and materials. During the fiscal year ending in March, 1932, 28 researches and 10 circulars, besides many private papers, were published by the laboratory.

**Fundamental Standards.**—The electrical standards legalized by the electrical measuring act enacted in 1910 have been maintained by the laboratory. During the past year, the electromotive force of Weston standard cells was determined against the silver voltameter, conformably to the decisions of the advisory committee on electricity. The redetermination of the international ohm by the new glass tubes was finished. The preparations for determining the absolute ohm by Maxwell's method and Carey Foster's bridge method have been continued and the preliminary results were obtained.

As the primary standard of frequency, two tuning-fork clocks driven by alternating current were constructed and maintained with a precision of 1 part in  $10^6$ .

The photometric standard has been maintained by a number of well seasoned incandescent lamps. The black-body standard of light is now under construction.



**Measuring Instruments.**—The laboratory is engaged in the legal verification of electricity meters. In the last fiscal year, eight types of watt-hour meters were approved and 138,886 meters were tested. In addition, 356,864 meters were tested by four laboratories under the supervision of the ministry. A new automatic device for testing watt-hour meters, driven by a constant frequency source, was constructed. In connection with the testing of instrument transformers, the phaseangle of Schering's high-voltage standard condenser was determined by the leakage method.

One thousand one hundred and forty-one tests of various measuring apparatus, such as indicating meters, recording meters, testing sets, resistances, inductances, condensers, etc., were requested.

**Telephony and Telegraphy.**—Various types of apparatus and devices used in telephony and telegraphy by the ministry were tested in the laboratory. Requests for 5,786 tests were received in the last fiscal year. In addition to these tests much work has been done in research. Several investigations have been carried out on the improvement of circuits and apparatus of automatic telephone exchange. Investigations for the purpose of improving printing telegraph apparatus and increasing the articulation efficiency of telephone transmitter and receiver have also been continued.

A theoretical study of the transmission characteristics of telephone circuits was accomplished. A new method capable of dealing with the case of telephone circuits unbalanced with respect to the earth was proposed, and preparations have been made to carry out some experiments on the basis of the theory.

**Electrotechnics.**—In connection with the standardization work of this section, many tests and investigations have been made in co-operation with the national electrotechnical committee. The important items are rating of electrical machinery and apparatus with special reference to performance under different ambient temperatures; the rupturing capacity of oil circuit breakers; the current-carrying capacity of cables; the pressure test of cables with d. c. voltage; standard methods for testing lightning arresters, insulating oil and insulators; and the life testing of electric lamps and the heating elements of electric heaters.

In the researches on machinery and apparatus, the performance of synchronous and asynchronous machines with secondary excitation under capacitive load, inverters, rectifiers, and the relation between noise characteristics and machine construction are the interesting items in progress.

The problems of lightning surges appearing in high-tension transmission systems and protection against them, inductive interference and its prevention, and electrolytic corrosion of underground metallic structures and its mitigation have been attacked by extensive field investigations.

Various illuminating engineering problems, such as of natural lighting gaseous discharge lamps and light distribution, have been studied.

With the viewpoint of a new field of utilization of electricity, the researches on electro-osmosis have been continued for several years. The problems of the purification of water, ceramic raw materials and waste molasses, and the treatment of wood have been investigated.



The researches on the mechanism of surface corona of dielectrics and puncture of solid dielectrics in nonuniform fields have been continued.

**Radio.**—Continuous observations, which had been conducted since 1925, on the low-frequency field strengths of long-distance stations were completed recently. Polarization measurements and directional observations were also finished. The results were arranged and published, together with a new theory of low-frequency transmission. With regard to the investigations of high-frequency propagation, a method of calculating the field strengths of high-frequency waves has been developed. High-frequency direction finding, using the rotating Adcock aerial, has been in successful operation. In addition, a new type of high-frequency direction-finding apparatus has recently been developed which works most satisfactorily. Applications of ultra-high-frequency waves were extensively studied. Wide transmission tests were carried out during the summer of 1932, the ultra-high-frequency waves being emitted from the observatory at the summit of Mount Fuji 3.7 km above the sea level.

A new method for the absolute measurement of frequency has been established which gives an accuracy of  $0.5 \times 10^{-6}$ , an interval of one minute being enough for the measurement. Extensive studies on piezo-electric crystals are being carried out; among them the most fruitful result obtained in developing a new quartz plate having a very small temperature coefficient of frequency.

New television apparatus has recently been devised. The pick-up of the sending object may dispense with any special illumination; it may be satisfactorily done with natural light. The apparatus is thus suitable for televising outdoor scenery such as sports.

The laboratory assists the activities of the national committee of the International Scientific Radio Union (URSI) and also contributes to the International Advisory Committee on Radio (CCIR) in solving the unsolved problems of radio technique.

**Materials.**—During the last fiscal year 2,433 tests on materials for telephone and telegraph uses were carried out, among which gutta-percha telephone and telegraph cables produced for the first time by a home manufacturer proved to be quite satisfactory.

The dielectric loss and surface leakage of a number of insulating materials at high frequencies were studied. A very efficient new method for the cleaning of used insulating oils was devised.

#### TOKYO INDUSTRIAL LABORATORY

(Yoyohata, Tokyo, Japan)

The Tokyo Industrial Laboratory, under the control of the Minister of Commerce and Industry of Japan, is engaged in solving industrial chemical problems, and deals with the analysis, testing, and examination of specimens, and consultation activities in order to promote the progress of Japanese industries.

Standardization activities, in cooperation with the Japanese Engineering Standards Committee (JESC), Bureau of Industrial Rationalization, the Association of Chemical Industry, and the Society of Rubber Chemistry of Japan, have been continued.

As a member of the JESC, the laboratory has been actively engaged in the preparation of specifications for pigments and petroleum products, and in the development of methods of analysis for iron and steels. During the past year the following projects in the number shown have been completed: Methods of analysis for irons and steels, 5; petroleum products, 6; and pigments, 9.

The laboratory is participating in JESC projects relating to the unification of terms and nomenclature, and technical matters dealing with the manufacture of paper. The sizes of writing paper have been simplified to eliminate many forms and sizes formerly used.

The results of the various investigations conducted by the laboratory are made available for ready application throughout the country through publication in a pamphlet entitled "Tokyo Kogyo Shikenjo Hokoku," or in recognized technical journals.

Several important publications relating to research and standardization were published during the year 1931, and to June, 1932.

#### MUNITIONS SUPPLY LABORATORIES

(Maribyrnong, Melbourne, Australia)

The laboratories, established in 1922, are under the direction of the Munitions Supply Board of the Defense Department, Commonwealth of Australia. The board supervises the provision of war materials, including ordinary necessities such as food, clothing, housing, transport, and communications, required by the naval, military, and air forces, and is responsible for the design of new factories and the control of commercial manufacture of munitions. The activities are carried out under seven main technical sections as follows: General chemistry, explosives and munitions, timber, metallurgy, physics, chemical defense, and technical information.

Specifications and designs covering supplies for the military originate in Britain, and the manufacture of identical equipment or of component parts must conform thereto, except in approved instances, to meet local conditions, to provide for correct assembly and interchangeability. Because of the special requirements of scientific control of the manufacturing processes involved in the production of most military equipment, the laboratories function to a considerable extent in making examinations for and in giving technical advice to private firms as well as in applying the necessary specification tests.

Where mass production and the manufacture of interchangeable parts are involved, no departure is permissible for dimensions and limits shown in imperial design drawings. The basic standard of length is the imperial standard yard, all dimensions being expressed in terms of that unit. Steps have been taken to maintain uniformity of standards of measurement with the National Physical Laboratory, and calibrations of precision instruments, reference gages, workshop gages, and tools are thus maintained on a uniform basis.

The Standards Association of Australia has accepted the metrological standards maintained at the Munitions Supply Laboratories as the reference standards for the control of engineering production in Australia.



The engineering testing equipment of the laboratories is calibrated in terms of the imperial standards of mass, and mechanical testing equipment throughout the country, under a plan in cooperation with the Standards Association, is maintained on a uniform basis.

Specialized equipment for carrying out the work of the various sections is available.

Other departments of the Government, both Federal and State, avail themselves of the facilities of the laboratories, and the services of the organization are available to commercial firms and private individuals for chemical or physical examination of materials and products, and for investigation where the special equipment of the laboratories is needed.

OFFICE NATIONAL DES RECHERCHES SCIENTIFIQUES ET  
INDUSTRIELLES ET DES INVENTIONS

(Bellevue (Seine et Oise), France)

This office is a State institution. It was created under the Ministry of Public Instruction of France on November 13, 1915, and received its final status by law on December 29, 1922. M. J. L. Breton is the present director. Its object is to initiate, coordinate, and encourage scientific researches of all kinds, including both those which may be conducted in scientific establishments and also those which may be undertaken by scientists outside of such organizations, to develop and coordinate especially those scientific researches which may be applied to the progress of national industry, to be responsible for studies requested by public services, and to aid inventors.

Proposals of inventions are examined by the Superior Commission on Inventions, and the projects retained by it are then studied by technical committees of the office, which arrange for their production by the appropriate bureaus or divisions. Aid for research is assured by the scientific research fund connected with the national office, which makes a grant yearly to the workers of the laboratories.

The office undertakes studies and inquiries requested by the public services. An important magnetic laboratory has been built suitable for the great electromagnet of the Academy of Sciences. The office has at its command, jointly with the National Office of Liquid Fuels, a great testing station for motors and machines.

The activity of the office extends into the most varied fields. Among the studies now in progress are tests of models of dams, undertaken jointly with the Ministry of Public Works, and studies on the prevention of fire and protection against conflagrations which comprise the inspection of alarms, fire extinguishers and extinguishing materials, and means of rescue. The Technical Committee on the Prevention of Fire, created in cooperation with the Ministry of the Interior, has its headquarters at the office. Other studies now being made by the office include the protection of cities against industrial fumes and their precipitation; various liquid fuels and notably the utilization of heavy oils in motors; the resistance of materials, particularly metal alloys, against corrosion and their protection by paint, varnish, and other coating of various kinds.



Researches are conducted on high-speed cinematography. Finally, the electromagnet, and the physical laboratories associated with it permit experiments on the action of very powerful magnetic fields. A technical committee on refrigeration was created last year. This committee is providing an important laboratory for scientific research at very low temperatures and for studying problems of industrial refrigeration.

The national office publishes a monthly review entitled "Recherches et Inventions," giving an account of its work.

USSR SCIENTIFIC RESEARCH INSTITUTE OF METROLOGY AND  
STANDARDIZATION (VIMS)<sup>1</sup>

(Formerly USSR Main Chamber of Weights and Measures)

(Moscow, USSR)

1. In order to insure uniformity, correctness, and mutual conformity of measures, measuring instruments and methods of measurements applied in science, engineering, industry, and commerce, under the All-Union Standards Committee of USSR State Planning Commission, shall be the Scientific Research Institute of Metrology and Standardization (VIMS).

2. The primary functions of the All-Union Scientific Research Institute of Metrology and Standardization shall include as follows:

(a) The development, construction, custody, and maintenance of reference and working standards obligatory in the USSR.

(b) The adoption of technical standards for standard measuring appliances (secondary standards).

(c) The checking of standard measures and measuring instruments, which are to serve for further checking of measures and instruments, supplying the former with special brands.

(d) The study and development of methods of physical and chemical measurements.

(e) Scientific and technical assistance in the manufacture of measuring and controlling instruments to be used in the Union.

(f) To act as an expert organization for the All-Union Standards Committee as to problems of planning the production of measuring and controlling instruments as well as problems concerning the import of such instruments from abroad.

(g) To elaborate projects of All-Union dimensional and quality standards (specifications) in the field of measuring and controlling instruments, as well as to work out, on the recommendation of the All-Union Standards Committee, draft standards and specifications for items within the activities of the USSR Scientific Research Institute of Metrology and Standardization, and to draw conclusions on such draft standards and specifications.

(h) To develop scientific methods of control over adherence to the All-Union standards.

(i) To train and raise the qualification of workers in the field of metrology.

(j) To bring to a conformity the plans of scientific research work in the field of metrology the committees of the federated republics, state departments, and institutions in USSR are concerned with, and to work out on their basis a compound All-Union plan for such work to be submitted to the All-Union Standards Committee for approval.

(k) To set up a contact and cooperation with the committees of the federated republics by means of mutual and regular information on the progress of work and of mutual assistance in scientific and engineering activities in the field of metrology and standardization.

<sup>1</sup>According to the decree of the USSR Soviet of People's Commissars No. 552 of July 11, 1931, the USSR Main Chamber of Weights and Measures has been reorganized into All-Union Scientific Research Institute of Metrology and Standardization under the USSR Standards Committee.

3. The All-Union Scientific Research Institute of Metrology and Standardization shall be entitled:

(a) To organize, with the permission of the All-Union Standards Committee, commissions for scientific research work, consisting of experts, foreign specialists included.

(b) To organize, with the permission of the All-Union Standards Committee, congresses and conferences for the elaboration of scientific research problems on metrology and standardization.

(c) To organize, with the permission of the USSR Standards Committee, competitions, lectures, shows, and scientific demonstrations relating to metrology and standardization.

(d) To publish, through the publishing office of the All-Union Standards Committee, transactions, scientific papers, reports, etc.

(e) To organize, in accordance with the plans approved by the All-Union Standards Committee, bureaus, laboratories, and auxiliary shops.

(f) To receive from abroad scientific technical books and papers, scientific instruments, appliances, and materials, with the rights and privileges granted to USSR Scientific Institutions.

4. The All-Union Scientific Research Institute of Metrology and Standardization shall be headed by the director with two substitutes approved by the All-Union Standards Committee.

The assignment of functions among the above shall be approved by the USSR Standards Committee, which approves also the organization and procedure of work for the institute (VIMS).

5. For the solution of scientific research problems, arising in the progress of work, under the Director of the All-Union Institute of Metrology and Standardization shall be an advisory body, the Scientific and Technical Council consisting of the following members: The director of the institute, his substitutes, individual workers of the institute and of members, personally appointed by the All-Union Standards Committee upon representation of the director of the institute. The latter is entitled to invite to the sittings of the Scientific and Technical Council other experts, whom he may consider necessary with deliberative votes. The Scientific and Technical Council shall have its sittings not less than once in three months.

6. The maintenance of the All-Union Scientific Research Institute of Metrology and Standardization shall be determined by the estimate of the All-Union Standards Committee of USSR State Planning Commission and within the budget of the USSR.

7. The Institute shall be entitled to use the seal of the All-Union Standards Committee with the name of the institute (VIMS) engraved.

#### IV. NATIONAL INDUSTRIAL STANDARDIZING BODIES

The first strong impact of standardization upon national industry was felt in 1901, when Great Britain established a committee to formulate standards for engineering materials. Not until 15 years later was another such committee organized, this time in the Netherlands. From then on, in almost yearly succession, some 19 countries have experienced such an enlightened self-interest in the standardization movement as to prompt them to set up national industrial standardizing bodies.<sup>1</sup> In addition to those countries in which national standardizing bodies are in operation, standardization is being carried on or has been proposed, on a more or less national basis, in other countries.<sup>2</sup>

Broadly speaking, the various national bodies study standardization from a technical and commercial point of view in every domain of industry. They afford an adequate organization and a more ample development for present standardizing activities, and establish generally recognized standards of various kinds. Industry is represented in its various manifestations at home and abroad. The most recent foreign innovations are utilized when helpful to domestic uses. In short, the various national bodies, functioning in a rôle of centralization, coordination, and liaison, further the standardization movement in every practicable way as a means of advancing national economy.

The following outlines, based largely on data furnished by the various countries through the American Standards Association, and by the foreign offices of the United States Bureau of Foreign and Domestic Commerce, attempt briefly to set forth the activities and accomplishments of the national industrial standardizing committees and associations in 20 of the countries in which such bodies exist. For the most part, there has been omitted from these sketches information relating to historical background and functions which has already appeared in previous editions of the Standards Yearbook. The work of the American Standards Association is reviewed in Chapter VIII (p. 164).

The International Federation of Standardizing Associations (ISA), which acts as a connecting link between most of the national bodies dealt with in this chapter, is discussed in Chapter II (p. 13).

<sup>1</sup> The following 21 countries now possess national industrial standardizing bodies, organized in the years indicated: Great Britain, 1901 (reorganized in 1931); Netherlands, 1916; Germany, 1917 (reorganized in 1926); United States of America, 1918 (reorganized in 1928); Switzerland, 1918; France, 1918 (reorganized in 1928); Belgium, 1919; Canada, 1919; Austria, 1920; Italy, 1921 (reorganized in 1930); Japan, 1921; Hungary, 1921; Australia, 1922 (reorganized in 1929); Sweden, 1922 (reorganized in 1930); Czechoslovakia, 1922; Norway, 1923 (reorganized in 1931); Poland, 1924; Finland, 1924; Russia, 1925; Denmark, 1926; and Rumania, 1928.

<sup>2</sup> In China, the Dutch East Indies, Greece, Haiti, India, Iraq, Latvia, Madagascar, New Zealand, Philippine Islands, Portugal, South Africa, and certain South American countries,



## AUSTRALIA

Standards Association of Australia (SAA), W. R. Hebblewaite, chief executive officer, Science House, Gloucester and Essex Streets, Sydney, New South Wales, Australia.

Promotion of simplification and standardization activities for the Commonwealth and State Governments of Australia is conducted by the Standards Association of Australia, which is recognized as the official authority for the promulgation of Australian national standards.

The technical work is carried on by divisions on standardization and simplified practice, and by a special power survey committee. The standards division directs the activities of 36 sectional committees which, with more than 500 subcommittees and panels, have a personnel of over 4,000.

Standards, specifications, codes, and simplified practice recommendations have already been prepared covering various major fields of industry.

During the last fiscal year there were published as Australian standards 4 specifications, 2 codes, and 3 simplified practice recommendations. In addition, 13 tentative specifications were reviewed by the electrical sectional committee and approved for issue as standard specifications; also, a considerable number of draft specifications and codes were completed and sent out for comment and criticism.

The total number of standards in force on June 30, 1932, was 168. There have also been issued six general and power survey reports.

The executive committee of the steel frame structures sectional committee has completed and issued a first draft of the code for steel frame structures. The steel structures committee has made considerable progress in the preparation of the code for structural steel in building. A third draft has been issued for subcommittee review.

The section of the boiler code relating to oxyacetylene welding has been revised by the welding committee as have also the draft regulations for welding (electric arc method).

During the year the SAA boiler code continued to receive favorable attention and to become established as the Australian national standard in matters affecting boilers and unfired pressure vessel design and control. The boiler and unfired pressure vessels committee is cooperating actively with the recently formed boiler committee of the British Standards Institution which was appointed to prepare British standard boiler rules.

Having in view the highest practicable degree of uniformity in specifications within the Empire, the bore casing committee is collaborating with a corresponding British committee in the formulation of specifications for collar-joint casing for oil and water bores, which will serve as a basis for the Australian standard for inserted joint casing.

The building materials committee carried on work in the preparation of specifications dealing with the following building and con-

struction subjects: Terra cotta and cement concrete roofing tiles, recommended practice in the fixing of tiles, color pigments for use with Portland cement, precast reinforced concrete lintels, cast stone, and cement laundry tubs.

The draft code on concrete and reinforced concrete structures has been completed and issued in proof form for comment.

Meetings of the subcommittees of the sectional committee on the code for cranes and hoists were held regularly throughout the year. The safety rules section of the code has been coordinated, and reviewed and approved for public criticism, as has also the section dealing with wire ropes.

The various subcommittees of the wiring rules sectional committee have held regular meetings for the purpose of dealing with requests for interpretation of the provisions of the wiring rules, for the settlement of disputes involving the rules, and for the examination of samples of electrical appliances and accessories. The committee has given study to matters affecting wires and cables, synthetic resin molding compounds, and the testing of lead-covered, cab-tire-sheathed, and flexible wires and cables.

During the year the ferrous metals coordinating committee has been engaged in making a review of a group of specifications to meet the requirements of the boiler code. The specifications dealt with, relate to carbon steel plates, tees, angles, and other rolled sections, carbon steel bar for rivets and manufactured rivets, hot-worked and cold-finished weldless steel tubes, charcoal iron wrought iron lapwelded tubes, grey iron castings, and carbon steel castings.

Tentative specifications for leather belting have been revised by the machine belting committee in order to bring the specified chemical tests into conformity with those of the International Society of Leather Trade Chemists. The committee has also reviewed the specifications for rubber conveyor and power transmission belting.

The machine parts committee has been actively engaged in developing specifications for the following items: Marking and coloring of patterns, black cup and countersunk bolt heads, plumber blocks, rivets, coach screws, grey iron and carbon steel castings, lathe centers, milling cutters and reamers, indicator cocks and cards, definition of tiles, and spur and helical gearing.

During the past year the refrigeration committee completed and issued the final draft of the refrigeration code. This committee is now investigating a proposal for the standardization of ice block and ice chest sizes.

The various States of the Commonwealth have been requested, and have signified their willingness, to arrange for the insertion in all departmental tender forms of a clause to the effect that all materials, unless otherwise specified, shall be in accordance with Australian standard specifications where such exist or, in their absence, with British standard specifications.

#### AUSTRIA

Österreichischer Normenausschuss (ÖNA), Dr. Jaro Tomaides, secretary, Vienna III, Lothringerstrasse 12, Austria.



The status of Austrian standardization as of July 1, 1932, is summarized in the following table:

Industrial groups	Completed standards	Published for criticism	Work under way	Total
A. General standards.....	7	3	14	24
B. Architecture.....	84	32	28	144
BH. Mining and metallurgy.....	42	0	17	59
C. Chemical industry.....	19	20	5	44
E. Electrical engineering.....	59	14	49	122
F. Fire protection.....	1	0	6	7
K. Hospital practice.....	7	3	8	18
L. Agriculture.....	0	2	8	10
M. Mechanical engineering.....	408	37	21	466
N. Provisions.....	0	1	0	1
T. Transportation.....	37	4	45	86
Total.....	664	116	201	981

During the fiscal year 1931-32 the ÖNA conducted preliminary work looking toward the formulation of standard size legal documents and envelopes. As a forward step in this movement the National Ministry for Justice recently ordered the introduction, on or before January 1, 1934, of standard forms in the courts of justice and the State attorney's office.

In the field of architecture, specifications were prepared for carpentry and painting, concrete and reinforced concrete work, and for glazing. The standards for elevator installation and operation, in which are incorporated the requirements of the Vienna municipal government, have recently been published as the so-called Elevator Book. Work is going forward on the setting up of standard contract forms for technical requirements for building construction. At present there are also being prepared technical requirements for the installation of gas, cold and hot water, and central heating appliances.

Standard specifications have been prepared for softwood roof timbers, screws and rivet steel, steel construction, and rivet arrangements in structural shapes and beams. Work is also going forward on the revision of standards for superstructures, and safe steel loads, as well as specifications for welded steel structures.

In the standardization of building materials revisions have been made to the standards for dimensions of sawn timber, vitreous plates, white lime, plaster slabs, plaster and slag slabs, cement and slag slabs, asbestos cement slabs, and wood paving blocks. The revision of standards for natural stone, street paving and roadbeds, addition materials for mortar, cement, and concrete was completed within the past year. Standards for asphalted roofing board, glass, gypsum, slag, and floor tile are now being revised. Committees were recently organized for the sampling of bituminous road building materials, and asphalt and tar for coating purposes.

In the field of canalization, standards have been formulated and published for cast-iron drain pipe and fittings, while a standard for concrete drain pipes with coupling sleeves is now being prepared by a committee.

In the mining and metallurgical field there have been issued over 40 standard sheets for ventilation shafts, chutes, rails, superstructures, mine cars, mine tools, and office forms. Additional standards



for tools and for switches, conveyor elements, mine timbering, and mine surveying are now being formulated.

The working group for technical oils and fats has taken up projects for seven types of automobile oils. The draft standard for vehicle greases and lubricants was modified as a result of recent developments in the field of oils and fats.

In the course of the work of the Gesellschaft für Wärmewirtschaft (GW) (Society for Heating), there have been carried forward by various committees for fuel, several standardization projects, including the testing of solid lump fuels.

With regard to the standardization work of the Electrical Society in Vienna, carried on under the auspices of the ÖNA, new editions of the following standard sheets were prepared and published: Electrical machines, shaft heights, rating plates, and operating voltages and frequencies of electrical installations.

The following standard sheets were published for criticism by the working committee for conductors, approved by the managing committee, and placed before the executive committee of the ÖNA: Insulated copper wire for machines and other apparatus; round copper wire, accurately drawn, for machines and apparatus; round wire with enamel insulating covering; round wire with silk, cotton, or paper insulating covering; round insulated copper wire, accurately drawn, for electric communication apparatus, technical conditions for supply, limiting values of resistance, and external diameter; and reels for supply of bare and insulated wire. Under consideration are drafts of standard sheets for commercial round copper for brush flexible leads, and for insulating tubes, porcelain lead-in tubes, and porcelain spools.

The working committee for overhead conductors has published for criticism, during the past year, drafts of the following reports: Hook and bracket insulators for operating voltages up to 500 volts, inclusive; cap and solid core insulators; overhead conductors; and straight and bent brackets for insulators.

The fire-protection section is continuing its activities in the preparation of standards for pressure-tube couplings, threads for suction hose, and various types of fire-extinguisher pumps.

Standards for hospital equipment and supplies relating to water and sitting cushions and cushion pumps, hot-water bottles, ice bags, hard-rubber cocks for drainage tubes, and chairs, have already been prepared and issued by the ÖNA. There are now in the course of preparation standards for basins, night tables, and bed tables.

In the mechanical engineering field there have already been prepared more than 120 standards covering nuts, screws, rivets, and washers. Also, standards for cast-nickel and chrome-nickel steel and wire rope have been formulated and published.

A committee has been organized to deal with the standardization of copper tubes and standard shapes for installation purposes.

Under the auspices of the Society for Heating (GW), standardization work has been begun relative to grates for brick ovens and hearths and for steam-heated hot-water supply apparatus and radiators for central heating.

In the scope of the provisions section a committee has been set up for standardization work in dairy matters, with subcommittees en-

gaged in standardizing milk bottles and milk cans. A draft standard has already been prepared.

In the transportation industry new standards were published for flat-tread tires for passenger motor cars and bolted joints for disk wheels. Work is now going forward in the preparation of standards covering automotive electrical equipment and materials for rolling stock.

Cooperation in the work of international standardization has formed a large part of the work of the ÖNA. This is especially true of committees on steel, screws, testing sieves, vehicle construction, and sprinkler specifications.

For the purpose of identifying products complying with standard specifications and in order to guarantee to the purchaser that certain commodities do comply with the specifications, the Austrian national standardizing body has obtained a copyright on an association mark to be placed or used on products. The right to use this mark on standard products is under control of the national standardizing body, and license will be issued only upon sufficient evidence and proof that the products to be stamped or labeled are in accordance with certain standards adopted by the body. A license fee of 10 Austrian shillings per item is charged which must be paid in advance. Any wilful abuse or illegal use of the mark, such as its use without approval of the Austrian body or its use on products that are not in accordance with the standards, will subject any individual or concern to prosecution under the law.

#### BELGIUM

Association Belge de Standardisation (ABS), Gustave L. Gérard, general secretary, Max Reichert, secretary, 33 rue Ducale, Brussels, Belgium.

During the year ended June 30, 1932, the association published a report on cast-iron flanged valves of the water and gas types. In addition, reports on insulated wires and cables, incandescent lamps, switches, plugs, sockets, cut-outs, and graphical symbols for low-current systems, were issued by the Belgian Electrotechnical Committee as part of the ABS series.

The association has submitted for general comment and criticism its standardization project on sampling and analysis of coal.

The progress report as of July, 1932, indicates the completion of 50 standards, with work progressing on 26 other projects. The distribution of standards and projects according to industrial groups is shown in the table below:

	Completed standards	Projects under way	Total
A. Civil engineering.....	9	3	12
B. Mechanical engineering.....	21	13	34
C. Electrical engineering (Belgian Electrotechnical Committee).....	18	2	20
H. Metallurgy.....	1	1	2
K. Chemical industry.....	0	2	2
M. Mining.....	0	2	2
P. Paper industry.....	1	0	1
Z. Miscellaneous.....	0	3	3
Total.....	50	26	76



## CANADA

Canadian Engineering Standards Association (CESA), B. Stuart McKenzie, M. E. I. C., secretary, 79 Sussex Street, Ottawa, Canada.

During the past year the main committee of the association approved two projects, bringing the total of completed standards to 36. These standards, together with proposals under way, are classified by industrial groups in the following table:

	Completed standards	Projects under way	Total
A. Civil engineering.....	7	11	18
B. Mechanical engineering.....	7	9	16
C. Electrical engineering.....	11	14	25
D. Automotive work.....	2	1	3
E. Railway work.....	1	0	1
G. Ferrous metallurgy.....	8	0	8
M. Mining machinery.....	0	1	1
Total.....	36	36	72

The association's more recently published standards cover standard blade punching for road grading machinery, reinforcing bars, steel wire for concrete reinforcement, stove bolts, and steel structures for buildings. Subjects on which work is going forward include building brick, cast-iron pipe, sheet metal gages, and electrical machinery.

A committee is being organized by the association for work on a safety code for passenger and freight elevators. While certain provinces and some of the leading cities have rules dealing with elevators, it is believed that uniformity in these rules is desirable and that they should be as complete as possible. Invitations to participate in the development of the project have been issued to the various Dominion and provincial government departments as well as to leading technical and insurance organizations and manufacturers.

Work on Part II of the Canadian Electrical Code, dealing with approval specifications for electrical apparatus, is now making good progress. A specification for power-operated radio devices has already been published, while specifications for oil burners, electric signs, circuit breakers, inclosed switches, electric clocks, portable display signs, condensers, etc., are under consideration. Part III of the code is under way.

## CZECHOSLOVAKIA

Československá Normalizační Společnost (ČSN), F. Juliš, manager, Dům inženýrů, Prague I, Czechoslovakia.

The preparation of national standards is carried on under the authority of the Czechoslovakian Standards Society (ČSN), chiefly by 190 special committees with more than 2,500 members. Standards are also prepared by other organizations, such as the Czechoslovakian Electrotechnical Association, the Masaryk Academy of Work, the Czechoslovakian Ceramic Society, and the Czechoslovakian Association for Testing Materials, and are submitted to the ČSN for final ratification.



Up to the end of 1932 the ČSN had published 95 standardization booklets, containing more than 2,300 standards. In addition, there had appeared 83 standard leaflets for locomotive construction, 58 for automobile construction, and 63 for aircraft. The most recent of the standards relate to rules for printers' work, conversion tables, shaft couplings, pipe couplings for machinery, files and rasps, drawn steel sections, copper and brass pipe, bronze and brass alloys for castings, white metal bearing alloys, marking of casting patterns, cast-iron scrap, thermal testing of steam boilers, refrigerating chambers, water supply regulations, identification marks for pipe systems, valves, welded steel structures, concrete structures, rules for joiners' work, rules for house painting, steel furniture for hospitals, laboratory glassware, and aircraft parts.

An important accomplishment of the ČSN has been standardization of the sizes and text of paper blank forms. Such standardized forms have been successfully introduced by a number of scientific, industrial, and commercial organizations, as well as by the national, provincial, district, and municipal governments. They have resulted in considerable savings not only in the matter of initial outlay, but also with respect to simplified ordering procedure, improved administration, and improved operating and accounting system. The standard paper size A4 (210 by 297 mm) has been adopted up to the present by 138 trade journals.

Standardization in the metal and machine industries has made good progress. Through the elimination of several special types, only 6 screw threads, in 168 sizes, are now in use. The standardization of various machinery elements, such as keys and cotter pins, has enabled small machinery plants to specialize in the production of these articles. The number of wrench openings has been reduced from 50 to 21; appropriate combinations of these wrenches has resulted in a swifter assembly of machines. Before standardization there were 1,119 sizes and shapes of seamless steel pipes; now only 116 are in use. Of 316 types of tempered steel fittings 88 per cent have been eliminated.

Following the example of other countries, the standards society has undertaken the standardization of carbon steel, the chief product of the Czechoslovak iron industry. The material has been grouped according to qualities and mechanical properties, and uniform test methods have been prepared.

Other metallic products for which simplifications have been carried out are rolled-iron beams, mine and field rails, and locomotives. A reduction from 70 to 5 railway gages has permitted the systematic standardization of car wheels and trucks.

An increased use of electric current and a higher degree of safety of electrical apparatus has been brought about by uniform rules and standards for electric elements, systems of currents and voltages, electric machinery and apparatus, wire and cables, electric fixtures and illumination, high-voltage equipment, house installations, electric equipment in mines, plants, and workshops, and physicians' electrical apparatus.

To certain electrical products, including insulators, switches, incandescent lamps, flat irons, vacuum cleaners, electric stoves, refrigerators, and physicians' apparatus, there is now being affixed a qual-

ity mark, which guarantees that the product conforms strictly to the requirements of the standard therefor.

## DENMARK

Dansk Standardiseringsraad (DS), H. E. Glahn, secretary, Industribygningen, Copenhagen, V, Denmark.

Three new technical committees were recently appointed by the Danish Standards Council to deal with the problems of preferred numbers, testing of coal and coke, and marking for electrical phases and polarity, so that at present there are functioning 23 technical committees, with 36 subcommittees and a membership of 245 persons.

During 1931-32 nine proposals were accepted as Danish standards, while 62 new proposals were published for criticism. Of the latter, 24 relate to testing methods for metals, 14 to textiles for hospitals, 5 to electrical symbols, 3 to technical drawings, and 16 to keys and keyways.

The complete list of 99 approved standards and 158 standardization projects may be subdivided as follows:

	Completed standards	Projects under way	Total
A. Civil engineering.....	6	24	30
B. Mechanical engineering.....	64	54	118
C. Electrical engineering.....	0	9	9
E. Cranes.....	2	0	2
G. Ferrous metallurgy.....	0	44	44
K. Chemical industry.....	0	1	1
L. Textile industry.....	6	9	15
N. Agriculture.....	0	3	3
P. Paper industry.....	0	1	1
Z. Miscellaneous.....	21	13	34
Total.....	99	158	257

## FINLAND

Finlands Standardiseringskommission (SFS), A. Willberg, secretary, Kairaniemigatan 6, Helsingfors, Finland.

The Finnish Standards Committee, through subordinate and affiliated technical committees, is carrying on activities in the fields of mechanical engineering, electrical engineering, metallurgy, wood-working, fire fighting, packing, graphics, and the paper trade.

On July 1, 1932, 255 standards had received official approval, while more than 500 projects were under way. The table classifies these standards and projects according to industrial groups.

	Completed standards	Projects under way	Total
A. General standards.....	0	25	25
B. Mechanical engineering.....	200	250	450
C. Electrical engineering.....	2	100	102
H. Raw materials.....	0	50	50
K. Chemistry.....	0	5	5
N. Agriculture.....	7	20	27
O. Woodworking.....	7	20	27
P. Paper.....	9	20	29
Z. Miscellaneous.....	30	30	60
Total.....	255	520	775

Finnish standardization work has heretofore concerned itself with dimensional simplification. Standards for the quality of iron and steel for various purposes, published during the past year, represent the first attempt in this country to construct quality specifications.

Other standards cover the subjects of screw and pipe threads, standard diameters, reference temperatures, technical drawings, machine tools, screws, nuts, washers, rivets, pins, keys, transmissions, piping, insulators, safety code for electrical machinery, spark plugs, harrows, cambridge and ring rollers, mowing-machine blades, wood-working tools, paper, envelope and card sizes, export packings, and fire hose and couplings.

#### FRANCE

Association Française de Normalisation (AFNOR), R. Girardeau, director general, 27 Avenue de Friedland, Paris, France.

The French Standards Association is a private organization financed largely by industry, which centralizes French standardizing activities, represents them internationally, and acts as a liaison between industry and the Higher Committee on Standardization (CSN), a governmental organization which controls French standardization through general instructions transmitted to the AFNOR, and which has the authority to give final approval to completed standards.

Among the associations affiliated with the AFNOR in the preparation of standards, and for which the latter body acts as liaison with the Higher Committee on Standardization, are the Mechanical Engineering Standardization Committee (CNM), Bureau of Automobile Standardization (BNA), French Electrotechnical Commission (CEF), Union of Electrical Syndicates (USE), Standards Bureau of the Aeronautics Branch, Ministry for National Defense (AIR), Bureau of Standardization for Watchmaking (BNH), and Committee on Standardization of Agricultural Machinery (CNA).

The AFNOR also works directly in preparing standards through its technical subcommittees for cotton and part-wool blankets, canned-food containers, fluid meters, hand tools, naval constructions, iron and steel products, sections, rails, nonferrous metals, chemical analysis, constructions for river navigation, paper, test pressures, coal, building construction and materials, petroleum products, sieves, stained paper, and carpets. During 1932 three other subcommittees, on wool blankets, drawn-wire products, and boiler plates, completed their work.

The following table gives a résumé of the status of work as of July 1, 1932:



	Completed standards	Projects under way	Revisions	Total
A. Metallurgical products.....	5	8	11	24
B. Construction materials.....	2	3	9	14
C. Electrical industry.....	20	23	0	43
E. Machine parts.....	12	0	0	12
Mechanical Engineering Standardization Committee (CNM).....	198	21	0	219
F. Metallurgy and metallic construction.....	8	3	2	13
G. Textile industry.....	3	1	0	4
H. Thermal and hydraulic machines.....	0	1	0	1
I. Chemical industry.....	0	1	0	1
J. Naval construction.....	6	31	2	39
K. Mining.....	0	1	0	1
L. Cycles and automobiles (Bureau of Automobile Standardization (BNA)).....	117	29	4	150
M. Units, tolerances, methods of measurement.....	0	1	0	1
O. Aeronautics (Standards Bureau of the Aeronautics Branch, Ministry for National Defense (AIR)).....	0	180	0	180
P. Building construction.....	0	1	0	1
Q. Paper.....	0	2	0	2
R. Containers and packing materials.....	4	8	0	12
S. Hand tools.....	0	5	0	5
T. River navigation.....	0	13	0	13
X. Preferred numbers.....	0	0	1	1
Agricultural machinery.....	0	4	0	4
Watchmaking.....	0	1	0	1
Textile machinery.....	0	1	0	1
Total.....	375	338	29	742

The association recently undertook the publication of the "Courrier de la Normalisation," a periodical devoted to standardization.

While it does not minimize the great value of dimensional standardization as an aid to mass production and interchangeability of parts, the AFNOR is emphasizing, at the present time, the importance of quality specifications for materials.

At the request of several industries, a subcommittee of the association is studying the advisability of adopting a standard mark of quality to be affixed to specification-made goods. Similar plans are being successfully carried out in numerous other countries.

#### GERMANY

Deutscher Normenausschuss (DNA), Dr. Eng. W. Hellmich, managing director, Berlin NW 7, Dorotheenstrasse, Germany.

The preparation of German standards is conducted under the supervision of the Deutscher Normenausschuss (DNA) (German Standards Committee) by organizations or special industry committees and by the Government. All standards approved and published by this body bear the symbol "DIN" to indicate their acceptance.

The standards are divided into two classes, "Dinormen" and "Fachnormen." The "Dinormen" include standards covering more than one industry, or the industrial field as a whole. "Fachnormen" are standards for subjects within particular branches of industry.

More than 3,700 standards have been completed up to the present time, while over 1,000 projects have been published for criticism; further proposals are in preparation. In addition, 1,200 standards have been prepared by the Merchant Marine Standards Committee (HNA).

During the past year the DNA published revised editions of three German handbooks relating to standards and specifications for ferrous and nonferrous metals, electrical machinery, transformers, and apparatus, and electrical installation materials. These publications represent part of a series of 18 handbooks designed to facilitate the use of the German national standards (DIN standards) by industry.

A standard system of paper sizes, originally developed and adopted in Germany, has also been adopted as a national standard in 12 other countries.

In the period from July 1, 1931, to June 30, 1932, there were published 395 new and 150 revised standards. In addition, tentative standards relating to 256 projects were published for criticism.

In the field of architecture revisions were made to the legal and technical regulations for soil drainage, while progress was made in the work on fireproof building materials and mortise locks, as well as in the work of the committee on surveying.

In the mining field work has been conducted in the standardization of colliery trucks and molds for coal briquettes.

Standards for wiring symbols and diagrams and lightning arresters were revised during the past year, while in other industries standardization work was carried on in the construction of textile machinery, worsted yarn spindles, surgical instruments for hospital use and printed forms.

Of the standardization sheets and standard rules completed and published within the past year, several relate to the following projects: German abridgement of the universal decimal classification, egg classification, construction and operation of electrical wiring systems on trading vessels, automobile construction, guiding principles for metal coach construction, cast-iron fittings, and surface marks.

At the present time committees are carrying forward standardization work on the subjects of building lime, gypsum, refractories, alluvial stone, vitreous pipe, installation of centrifugal pumps in coal mines, adding machines, tools for telegraph construction, rubber goods for hospitals, dental instruments, and lubricants and lubricating apparatus.

The gas division of the DNA is conducting work of special interest, namely, formulating standards for gas cocks, cookers, hearths, gas meter screw couplings, and test methods for gas meters, water heaters, and gas ovens; it is also developing standard methods for the manufacture and supply of gas reservoirs for high and low pressures.

The following tables summarize the present status of work. In Table 2 the symbol appearing after each item indicates the organization responsible for preparing standards in that particular industrial group.

TABLE 1.—“*Dinormen*”

Classification	Number of standards		Classification	Number of standards	
	Total	Com- pleted		Total	Com- pleted
Bottles.....	4	4	Machine tools.....	50	34
Building industry.....	454	401	Mechanical engineering.....	358	306
Burial practice.....	1	1	Office and drafting equipment.....	3	1
Chemical apparatus made from acid-resisting earthenware, cast- iron and steel castings.....	13	5	Photography.....	9	5
Construction materials.....	106	92	Piano construction.....	5	2
Dispatching means.....	1	1	Pipes and tubes.....	250	130
Fittings (valves, pressure gauges).....	101	71	Railroads.....	55	33
Foundry practice.....	8	3	Sewing machines.....	6	6
Furniture.....	5	4	Shoe manufacture.....	8	8
Gas masks.....	15	5	Steam boilers.....	4	3
Gas-welding industry.....	8	8	Steel cylinders for the storage and transport of gases.....	10	0
General fundamental standards and technical fundamental standards.....	331	299	Tools.....	301	234
Heating.....	4	4	Transmission.....	24	24
Hoisting machinery.....	19	18	Typewriters.....	31	29
Housekeeping.....	73	72	Underground construction.....	4	0
Library practice.....	6	6	Water turbines.....	5	5
Load and acceptance testing.....	4	4	Weighing machines.....	3	3
Machine-shop jigs and fixtures.....	20	11	Welding practice.....	5	5
			Total.....	2,304	1,837

TABLE 2.—“*Fachnormen*”

Classification	Number of standards		Classification	Number of standards	
	Total	Com- pleted		Total	Com- pleted
Agriculture (LAND).....	108	39	Mining (BERG).....	314	222
Air travel (L).....	57	50	Motion-picture industry (KIN).....	7	0
Automotive industry (Kr).....	219	204	National Committee on Specifi- cations (RAL).....	5	
Bicycle building (FAFA).....	41	38	Printing trade (NAGRA).....	6	
Chemical apparatus (DENOG).....	99	90	Railway cars (WAN).....	110	76
Committee on Economic Manu- facture (AWF).....	1	1	Shipbuilding (HNA).....	1,304	1,194
Electrical engineering (VDE).....	410	391	Street-railway practice (VDV).....	26	8
Fire fighting (FEN).....	44	19	Surveying practice (VERM).....	26	8
Goggle-optics (TABO).....	2	2	Textile industry (TEX).....	117	95
Hospital practice (FANOK).....	139	73	Woodworking machinery (VDH).....	10	10
Locomotive construction (LON).....	520	455	X-ray practice (RÖNT).....	4	3
Material testing (DVM).....	61	26			
Meat-cutting machines (VDF).....	10	10	Total.....	3,640	3,025

## GREAT BRITAIN

British Standards Institution, C. le Maistre, C. B. E., director and secretary, 28, Victoria Street, London, SW. 1, England.

As a direct result of the ever-widening activities of the British Engineering Standards Association, and in answer to the strong desire for a centralized national standardizing body in each of the countries composing the British Empire, the former association was, in November, 1931, reorganized and renamed the British Standards Institution. This independent body, free from governmental control but possessing the fullest governmental support, is in close touch with industrial requirements and modern technical knowledge.



The institution cooperates with standardizing bodies in the various parts of the British Commonwealth of Nations in accordance with the desire of the last Imperial Conference for the closest co-ordination of all standard specifications issued within the Empire, and the preparation of joint commercial specifications based on standardization and simplified practice prepared by agreement between any two or more of the countries in the British Commonwealth of Nations. It is in direct touch with the standardizing bodies in foreign countries and participates directly or indirectly in the work of international standardization as and when industry so desires.

It is interesting to note that more than 400 specifications, exclusive of some 165 for aircraft materials and component parts issued in cooperation with the Air Ministry, have been released by the institution to date. These specifications are based on what is best in present practice, providing a generally suitable standard of performance, quality, or dimension, and an equitable basis for tendering. Wherever possible, the specifications deal only with performances.

That the economic value of the work done by the institution is widely recognized is well attested by the increasing amount of standardization it is being asked to undertake. Among the specifications issued during the past year of interest to mechanical engineers alone are those relating to steel tub wheels and axles, lathe centers, leather belting, boiler rivets, and valve fittings for cylinders. In the public works section several specifications relating to road construction have been published. Developments in the comparatively recently established chemical division are considered an outstanding feature of the reorganized institution.

The institution recently registered a trade-mark which may be used by firms desiring to indicate that products manufactured by them comply with the requirements of British specifications for such products as paints and varnishes, road-making materials, electricity-measuring instruments, electric switches, cement, electrical insulators and insulating materials and other electrical supplies.

#### HUNGARY

Magyar Ipari Szabványosító Bizottság (MISz), Ed. Gellért, secretary, Reáltanoda utca 13-15, Budapest IV, Hungary.

The main body and the executive committee of the Hungarian Engineering Standards Committee are at the present time undergoing reorganization. The work of the MISz is carried out mainly by the sectional committee method. Thirteen sectional committees are now at work, each committee being composed of representatives of industrial and engineering corporations, societies and companies, government agencies, and technical schools. A department including four sectional committees has been organized for establishing standard specifications and methods of test for textile materials. Standards on subjects of electrical engineering are prepared by the Hungarian Electrotechnical Commission.

Up to July, 1932, the Hungarian Engineering Standards Committee had adopted 15 standards, while work was going forward on 83 projects.

## ITALY

Ente Nazionale per l'Unificazione nell' Industria (UNI), I. Locatelli, general secretary, Foro Bonaparte, 16, Milano, Italy.

Up to the present, 158 standardization proposals have been prepared by the technical committees of the UNI and submitted, after coordination by the central technical commission, for ratification by the board of directors as Italian standards. These standards relate to such subjects as rules for technical drawings, various types of threads, standard diameters, tolerances and fits, bolts and screws, splines, rivets, and automotive details. Many of them have been made mandatory for Government departments and administrations.

The program of work includes numerous other important projects, on nonmechanical as well as mechanical matters, many of which are now in course of development.

## JAPAN

Japanese Engineering Standards Committee (JESC), Y. Goto, general secretary, care of Bureau of Industrial Rationalization, Department of Commerce and Industry, Tokyo, Japan.

Japanese standards are prepared by 38 technical subcommittees, which may be grouped under the four main classes of metals, nonmetallic materials, electrical machinery and instruments, and mechanical equipment and supplies.

The progress report of July 1, 1932, lists 155 standards which have received the committee's approval, together with 41 projects still under way. The following table summarizes these results by industrial groups.

	Completed standards	Projects under way	Total
A. Civil engineering and building trades .....	11	0	11
B. Mechanical engineering .....	38	5	43
C. Electrical engineering .....	12	5	17
E. Transportation .....	0	2	2
F. Naval architecture and marine engineering .....	17	9	26
G. Ferrous metallurgy .....	27	4	31
H. Nonferrous metallurgy .....	21	5	26
K. Chemical industry .....	23	9	32
O. Wood industry .....	2	0	2
P. Pulp and paper industry .....	1	1	2
Z. Miscellaneous .....	3	1	4
Total .....	155	41	196

Among the draft proposals under consideration by the committee is a standard method for sampling and analyzing coal, prepared and approved by the Japanese Committee for Standardizing the Analysis of Materials. The proposed standard, which may also be applied to coke and lignite, contains requirements on sampling, preparation of the analytical sample, and technical and elementary analysis for determination of heating value, in addition to a form for the recording of results.

Approved Japanese standards cover such subjects as brick, cement, tile, stone, slate, radiators, metallic and nonmetallic pipe and tubing, pipe and screw threads, files, drills, pulleys, belting, bolts, screws, nuts, washers, keys and keyways, pipe flanges and fittings, valves,

gages, reamers, scales, wires, lamp sockets, transformers, oils, insulators, electric motors, brushes, chain cables, rope, bollards, ventilators, stanchions, other ship appurtenances, structural steel, nonferrous metals, metallic castings, forgings and shapes, paints, chemical analysis of nonferrous metals, chemical analysis of impurities in iron and steel, timber and lumber, charcoal, paper sizes, preferred numbers, and technical drawings.

#### NETHERLANDS

Hoofdcommissie voor de Normalisatie in Nederland (HCNN), J. A. Teyinck, secretary and director of the Centraal Normalisatie Bureau, Koningskade 23, The Hague, Holland.

An administrative council and technical council, formed as a result of a recent reorganization within the Hoofdcommissie, are now in active operation. The administrative council is charged with the general direction of the Hoofdcommissie and the Central Standardization Office, and with the responsibility for the funds. The technical council supervises the working of the technical standardization committees.

For the carrying on of standardizing activities there are now in operation three joint committees, 46 standardization committees, and 58 subcommittees, with a total of about 670 members. These committees are working on such subjects as high-current installations, technical drawings, symbols for low-current connection diagrams, pipe lines and sanitary installations, limits and fits, transmission belts, chains and hoisting appurtenances, electrical wire and cable, building regulations, sewers and sewer details, fittings for shipbuilding, incandescent lamps, screws and appurtenances, working voltages, small electrical machines and transformers, beverage bottles, paper sizes and test methods, wood, brick, molded blocks, natural stone, cementing materials, asphalt, linseed oil, paints, iron and steel test methods, fire protection apparatus, traffic signals, steel containers for compressed gases, industrial narrow-gage railways, water piping, textiles and furniture for hospitals, rivets, aeronautic equipment and supplies, and household textiles.

The Standardization Council in the Dutch East Indies is cooperating with the Hoofdcommissie by collecting and transmitting to that body criticisms and comments on proposed Dutch standards.

During 1931, 25 new standards were approved, while 39 projects were published for criticism. According to the latest available report, there are now 390 approved and 150 tentative Dutch standards. About 300 projects are under way.

#### NORWAY

Norges Standardiserings-Forbund (NSF), Kaare Heiberg, director, Konges gate 15, Oslo, Norway.

Standards of this organization are prepared by 55 technical subcommittees, with a present personnel of 285. After the customary publication for general comment and criticism, standardization proposals are submitted for final ratification to a main committee, or board of representatives, which consists of 35 persons representing the various technical societies, trade associations, and governmental departments interested in the Norges Standardiserings-Forbund.



During the first half of 1932, 17 new proposals were approved, bringing the total of Norwegian standards to 265. These may be classified as follows:

	Number of standards		Number of standards
Drafting-room practice.....	24	Paper sizes.....	8
House building.....	56	Shipbuilding.....	6
Mechanical engineering.....	149		
Packings for agricultural products.....	14	Total.....	265
Packings for fish products.....	8		

During the fiscal year 1931-32, work progressed on standards for doors and windows, kitchen equipment, steel constructions, paving stone, brick, Portland cement, building contracts, carriage bolts, eye bolts, eye nuts, core screws, milling-cutter profiles for dressing lumber, taper shanks and drills, pulleys, diameter of shafts and number of revolutions, shaft ends, flange couplings, bushings, flanges, flange tightenings, manometers and vacuum meters, scientific and engineering symbols and abbreviations, bollards, rail stanchions, blocks and sheaves, cargo-boom fittings, shackles, thimbles, packing for fruits and vegetables, and portfolios for letters and documents.

Items which will be taken up in the near future are textiles and accessories for hospitals, containers for liquid and other compressed gases, and gas masks.

#### POLAND

Polski Komitet Normalizacyjny (PKN), A. Rogiński, director, Ministerstwo Przemysłu i Handlu, Elektoralna, 2, Warszawa, Poland.

Organized in 1924 by the Minister of Commerce and Industry, the Polish Standards Committee prepares specifications for goods purchased by Government establishments and assists in establishing manufacturing standards for the industries of Poland.

Technical work is handled by 22 subcommittees, whose operations cover the subjects of ferrous metals, nonferrous metals, building construction, technics of the workshops, machine parts, machinery, automobiles, steam boilers, chemical technology, aviation, textiles, leather, ameliorations, classifications of coal sizes, wheels and farm wagons, sanitation equipment, fire fighting, piping, oil industry, hospital equipment, and general matters.

There have been completed and promulgated, with French translations, 498 Polish standards. Technical committees are at work on 333 proposed standards, which may be classified as in the following table:

	Proposed standards		Proposed standards
Aircraft.....	20	Mining.....	3
Automobiles.....	25	Nonferrous metallurgy.....	17
Chemical industry.....	20	Miscellaneous.....	25
Civil engineering and building trades.....	14		
Ferrous metallurgy.....	9	Total.....	333
Mechanical engineering.....	200		

#### RUMANIA

Comisiune Românește de Normalizare, P. P. Dulfu, secretary, Strada Clemenceau 6, București III, Rumania.

Commercial and industrial standardization work in Rumania is carried on by the Rumanian Commission of Normalization, which was organized in 1928 by the Rumanian Institute of Scientific Management, for the simplification of economic activity and the consequent lowering of production costs by the study, application, and development of standardization in Rumania; the coordination of private organizations interested in standardization; and the representation of the Rumanian standardization movement in its relations at home and abroad.

The work of the commission is chiefly of an advisory nature. Standards prepared by various subordinate or affiliated organizations are submitted to it for approval as Rumanian standards. Suitable foreign standards may be adapted to domestic needs.

While no report is available on the number of standards adopted to date, it is known that work has been completed or is going forward on paper sizes, transmission belts, drill tubing, a Rumanian technical dictionary, mechanical parts, forms of purchase specifications, and subjects relating to electrical engineering.

Oficiul de Raționalizare și Normalizare (ORN), Ing. Mihai Vasiliu, director, Ministry of Industry and Commerce, Strada Petre Poni, 2 București II, Rumania.

The office for Rationalization and Standardization (ORN), while working in cooperation with the Rumanian Commission of Normalization, is principally concerned with matters affecting the Rumanian governmental departments. It is engaged in the preparation of specifications for and conditions of supply of materials purchased by the State administrations, and in the formulation of laboratory methods for testing such materials. Standards of the Rumanian Commission of Normalization are adopted where applicable.

According to the latest available progress report, 287 specifications have been approved and published by the ORN, while 74 specifications are in course of being approved. The ORN has also established a number of test methods, in addition to those mentioned in the text of the specifications.

A summary of the work accomplished is presented in the following tables:

*Specifications*

	Approved	In course of approval	Total
A. Ferrous products.....	9	8	17
B. Nonferrous products.....	0	0	0
C. Building materials.....	49	13	62
D. Wood industry.....	5	2	7
E. Chemical industry.....	49	10	59
F. Electrical engineering.....	9	1	10
G. Pharmaceutical substances and medical apparatus.....	26	4	30
H. Fuels.....	13	1	14
I. Textiles and clothing.....	25	11	36
K. Leather goods and footwear.....	8	5	13
L. Paper and office supplies, calculating machines, typewriters, etc.	9	9	18
M. Rubber goods.....	2	3	5
N. Motor vehicles.....	10	7	17
O. Domestic animals.....	2	0	2
P. Photographic apparatus and supplies.....	47	0	47
Q. Foodstuffs.....	24	0	24
Total.....	287	74	361

*Test methods*

	Approved	In course of approval	Total
Building materials.....	6	2	8
Fuels.....	2	0	2
Textiles.....	3	0	3
Leather goods.....	7	0	7
Chemical substances.....	1	0	1
Total.....	19	2	21

## SWEDEN

Sveriges Standardiseringskommission (SIS), Amos Kruse, managing director, Malmorgsgatan 10, Stockholm 16, Sweden.

Since the Swedish Standards Commission commenced its activities in 1922 it has established 449 Swedish standards. Of these, the major part, or 343, are industrial machinery standards, including a number of machine elements, such as screws of all kinds, nuts, rivets, cotter pins, ball bearings, tubes and pipes, various tolerance determinations for diameter gage, etc., which have been established upon the basis of suggestions made by the Swedish Industrial Machinery Association. This latter organization maintains its own standardization bureau (SMS), which is working exclusively on matters of standardization and is preparing suggestions regarding standardization in this special field.

Upon the suggestion of the Swedish Electro-Industrial Association, there have been approved and published 37 Swedish electro-technical standards, as well as a number of provisional standards for electrical machinery and transformers, together with suggested rules for the manufacture of lightning arresters.

In the field of agriculture the commission has up to the present established 25 standards. Certain suggestions for carpentry and building fittings have been approved as provisional standards.

After several years of investigation a uniform terminology for industrial cost estimates has been prepared as a provisional standard. Some 30 proposals for the standardization of bicycle parts have been published for criticism. Work is going forward on the standardization of glass milk bottles and convex boiler ends.

In the table below there is given a résumé of the status of work in the various industrial groups.

	Approved standards	Projects under way	Total
A. Civil engineering and building industry.....	0	19	19
B. Mechanical engineering.....	343	149	492
C. Electrical engineering.....	37	13	50
E. Transportation.....	23	5	28
F. Ship building.....	0	1	1
G. Ferrous metallurgy.....	1	3	4
M. Mining.....	0	62	62
N. Agriculture.....	25	13	38
O. Wood industry.....	7	1	8
P. Pulp and paper industry.....	0	1	1
R. Glass and pottery.....	4	7	11
Z. Miscellaneous.....	9	1	10
Total.....	449	275	724



## SWITZERLAND

Schweizerische Normalien-Vereinigung (SNV), Normalienbureau des Verein Schweizerische Maschinen-Industrieller (VSM-NB), H. Zollinger, secretary, Lavaterstrasse 11, Zurich 2, Switzerland.

Industrial standardization in Switzerland is carried on by two organizations, the Schweizerische Normalien-Vereinigung (Swiss Standards Association) (SNV), and the Normalienbureau des Verein Schweizerische Maschinen-Industrieller (Standards Bureau of the Association of Swiss Machine Manufacturers) (VSM-NB).

The Swiss Standards Association, representing the cooperative activities of about 30 national organizations, is engaged in the standardization of such subjects as paper sizes, letterheads, envelopes, addressing of letters for window envelopes, promotion pamphlets for travel and transportation, hose couplings for fire-fighting equipment, and electrical materials, including wire and cable, lamp sockets, and fuses. The VSM Standards Bureau acts as its central office.

The VSM Standards Bureau is concerned with questions of standardization of interest to the members of the VSM. It contributes to the creation of national standards, and carries on preliminary work for international standards.

The Standards Bureau is composed of a standardization committee with executive powers, various technical committees, and an office. The standardization committee assumes jointly with the directorship of the VSM full responsibility for the organization, administration, and technical work of the Standards Bureau. It decides on the acceptance of proposals for standardization and on the final ratification of elaborated projects as VSM standards.

Technical committees, at present 26 in number, handle the actual preparation of standards. They cover the subjects of drawings, dimensions of semimanufactured metallic products, screws and accessories, keys, shaft heights and ends, couplings, ball bearings, adjusting rings, handling elements, pipe systems, pipe unions, pipe fittings, manometers and thermometers, fittings and mountings, tools, machine tools, abrasive wheels, thread tolerances, ferrous and nonferrous raw materials, limits and fits, copper wire and cables, and preferred numbers.

The office coordinates the work of the technical committees, handles the editing, publication, and sale of standard sheets, and distributes propaganda concerning the standardization movement. In addition, it acts as a liaison with other national or foreign organizations.

Standardization proposals, after being elaborated by the technical committees, are published for general comment and criticism in the Swiss Technical Review (STZ). If no objections are raised, the proposals may be ratified as standards and subsequently published. In certain instances where the technical committee concerned has had insufficient data at its disposal, a project may be published as a "provisional standard" until it can be tried out in practice.

Although its budget was curtailed during 1931, the Standards Bureau, through a reorganization, was able to carry on a considerably

greater amount of work. Work progressed on 308 subjects in 1931, as compared with 185 subjects in 1930. Ninety-two standard sheets were published, as against a previous average of 30 sheets a year.

There is given in the following table a summary of standards completed and under way, according to the latest available progress report. The classification used was adapted in 1918 from that used in the Swiss Exporters' Register.

Group No.	Industrial group	Completed standards	Standards under way	Revisions	Total
10000	General fundamental standards.....	36	5	0	41
10600	Raw materials.....	1	13	6	20
11000	Semimanufactured products.....	4	43	0	47
12000	Elements of construction.....	193	18	2	213
15000	General machine elements.....	17	29	5	51
16000	Handling elements.....	7	4	0	11
18000	Pipe systems.....	110	23	22	155
19000	Fittings and mountings.....	11	8	0	19
23000	Electrical engineering.....	0	8	11	19
33000	Machine tools.....	18	25	0	43
34000	Tools.....	7	41	11	59
38000	Elevators.....	1	0	0	1
51000	Gas and water supply.....	30	0	0	30
52000	Combustion installations.....	1	0	0	1
58000	Measuring tools.....	79	2	2	83
59000	Registering and measuring instruments.....	75	2	5	82
	Total.....	590	221	64	875

Standards are regularly issued in the German language. Where there is a sufficient industrial demand, French translations are also prepared.

In the interests of international standardization, the Standards Bureau is now publishing on the reverse of its standard sheets indications of agreement with similar foreign standards.

#### UNION OF SOVIET SOCIALIST REPUBLICS (RUSSIA)

All-Union Standards Committee, Council for Labor and Defense, A. K. Gastev, president, Razin Street, 12, Moscow, U. S. S. R.

Standardization is given a place of marked importance in the U. S. S. R. plan for national economy. As evidence of this fact, it is noted that the Soviet Government has clothed the All-Union Standards Committee with the powers of a supreme supervising and methodological center, whose activities are to be concentrated on the development of leading standards covering the fundamental technical and production problems of national economy.

Perhaps the chief interest in standardization at the present time lies in the direction of machine construction, and particularly machine parts, units, and accessories. Second in importance to such standardization, and closely coordinated with it, is that which pertains to various classes of ferrous and nonferrous materials. Intensive standardization of fuels and ores is being carried out to the end that concentration plants and equipment may be set up in the respective industries.

Not only are individual products being standardized, but whole installations and buildings are coming within the scope of the movement. For instance, in the metal industry blast furnaces and open-hearth plants are being designed on standard lines to fit the needs

of the machine building and construction industries which use these products. In addition to the standardization of parts and accessories of industrial and residential buildings, a start has been made in the direction of design of entirely standardized structures.

The number of approved standards has increased rapidly each year from 42 in January, 1927, and 2,888 in July, 1931, to 4,118 in July, 1932. The distribution of such completed standards according to industrial groups is shown in the following statement:

	Completed standards		Completed standards
Agriculture.....	278	Power generation.....	2
Building.....	337	Printing.....	42
Building materials.....	75	Pulp and paper industry.....	57
Chemical industry.....	376	Silicates and ceramics.....	131
Clothing.....	176	Textiles.....	119
Coal and metal mining.....	43	Transportation.....	266
Electrical engineering.....	102	Woodworking.....	54
Foodstuffs.....	369	Miscellaneous.....	86
Leather and furs.....	263		
Machine construction.....	144	Total.....	4,118
Metal working (except machine construction).....	1,198		

The U. S. S. R. Scientific Research Institute of Metrology and Standardization (VIMS), a recent reorganization of the Main Chamber of Weights and Measures, is now in charge of the metrological work of the All-Union Standards Committee. The institute numbers among its duties the development, construction, custody, and maintenance of mandatory primary and secondary standards; the checking of measuring instruments used for reference purposes; the study and development of methods of physical and chemical measurements; the training of workers in the field of metrology; and the rationalization of plans for scientific research on this subject.

#### UNITED STATES OF AMERICA

American Standards Association (ASA), P. G. Agnew, secretary, 29 West Thirty-ninth Street, New York, N. Y. (See Chap. VIII, p. 164.)



## V. FEDERAL STANDARDIZING AGENCIES (U. S. A.)

The Federal Government through the medium of its various agencies continues each year to develop and improve standardized methods to be employed in its business and research activities. The Government assists industry in standardizing and simplifying its products. It aids in the protection of its citizens by preparing regulations governing the production and sale of foods and drugs. Continued research provides the means for developing standards for the protection of health and the prevention of disease. Information concerning earlier activities and accomplishments along these lines can be found in previous editions of the Standards Yearbook.

### Executive Departments

#### DEPARTMENT OF AGRICULTURE

##### BUREAU OF AGRICULTURAL ECONOMICS

New standards for farm products formulated include those for cottonseed, cabbage for sauerkraut, sweet corn for canning, table grapes, raspberries, peanuts, yearling beef, canned applesauce, grapefruit, and mushrooms. Several of the current standards and check list of standards were revised during the year.

One of the outstanding developments in the application of standards has been the inauguration of the Federal grading service on canned fruits and vegetables. Within a few months after this service was put into effect samples of hundreds of thousands of cases of canned fruits and vegetables were graded at the request of commercial concerns and Government departments.

The beef grading and stamping work to denote quality has increased greatly.

The first exports in commercial quantities of soybeans from this country occurred during this year. Some authorities state that the uniform standards of quality applied by Federal licensed inspectors was a factor in attracting European buyers to the United States supply.

Several series of grading schools have extended knowledge and use of the bureau's standards to teach the grading of such varied products as wool, tobacco, and turkeys.

##### BUREAU OF CHEMISTRY AND SOILS

##### Chemical Engineering Division

This division conducts investigations relating to the determination of causes of dust explosions in manufacturing establishments and in the development of methods of control and prevention. The

work is conducted in cooperation with Government, State, and other interested organizations.

This division cooperates with the National Fire Protection Association in the work of the dust explosion hazards committee, which functions as a sectional committee of the American Standards Association. The committee has developed the following safety codes for dust explosion prevention: Flour and feed mills, sugar and cocoa pulverizing systems, terminal grain elevators, pulverized fuel installations, starch factories, spice-grinding plants, coal pneumatic cleaning plants, wood-flour manufacturing establishments, and inert gas for explosion and fire prevention.

These codes have been adopted by the National Fire Protection Association, and are being promulgated by a number of State and municipal authorities as the basis of regulatory measures and are also used by the fire insurance organizations. They have also been approved by the American Standards Association and published as a Department of Labor Bulletin entitled, "Safety Codes for the Prevention of Dust Explosions."

#### Food Research Division

The Bureau of Chemistry and Soils and the Food and Drug Administration are jointly represented on the American Chemical Society's committee on analytical reagents. Critical studies are made of many of the methods of test which are to be prescribed in the specifications. Specifications for 7 chemical reagents were published, and specifications for 10 additional chemical reagents were completed for publication. Reagent chemicals purchased under specifications for the Bureau of Chemistry and Soils and the Food and Drug Administration are given rigid examination before acceptance. Improved and more rapid methods of testing are being developed.

This division is represented on two committees of the Federal Specifications Board.

#### Industrial Farm Products Division

This division participates, by representation on the paper committee of the Joint Committee on Printing in the preparation of specifications and schedules for papers for public printing and binding. This division is represented on three committees of the Federal Specifications Board. It cooperates with the American Society for Testing Materials, the Association of Official Agricultural Chemists, the American Leather Chemists Association, and the Tanners' Council of America.

#### Protein and Nutrition Division

The health committee of the League of Nations adopted standards for vitamins A, B, C, and D. The quantity of a comparatively stable substance for each of the vitamins which would contain one unit of the vitamin was defined. The British Medical Research Council was authorized by the League of Nations to prepare three of the standards for vitamins A, B, and D. These standards have

been prepared and will be sent to a central institution in each country to be distributed to laboratories engaged in vitamin research. The allotment for the United States has been sent to this division, pending arrangements for distribution.

A member of this division served on the vitamin committee of the United States Pharmacopœia, which was organized to formulate standards of vitamin content and methods of assay for cod liver oil.

#### BUREAU OF HOME ECONOMICS

The bureau is represented on the council of the American Standards Association and has aided in formulating specifications for household refrigerators now adopted. Similar work has been undertaken on sheets and blankets.

Representatives of this bureau also serve as members of the committee on standardization of consumers' goods of the American Home Economics Association. This bureau is represented on committees of the National Electric Light Association and the American Gas Association.

#### BUREAU OF PLANT INDUSTRY

The division of seed investigation through participation in the work of the Association of Official Seed Analysts of North America has assisted in the formulation of rules for the testing of seeds, which rules are followed by both the official seed-testing laboratories of the United States and Canada and by the seed-merchandising interests.

In cooperation with the International Seed Testing Association this division has assisted the international commerce in seeds in formulating rules governing the testing of seeds passing in international trade and has adopted a form of certificate to accompany such sales.

Through the activities of the above organizations the work of all seed testing laboratories has been placed on a more practical basis to the end that the plant-producing value of seeds is more accurately and uniformly indicated.

#### BUREAU OF PUBLIC ROADS

The bureau has continued the work of standardization of tests, specifications, and methods of road construction in connection with the administration of Federal-aid road construction.

A large part of the standardization activity of the bureau has been in cooperation with technical committees of various national organizations interested in the development of specifications for highway materials.

Cooperation with the American Association of State Highway Officials.—The bureau is represented on the committee on materials in developing standard specifications and standard methods of testing road materials, and on the committee on bridges and structures in formulating specifications for movable bridges.

Cooperation with the American Concrete Institute is secured by representation on the committees on specifications for aggregates



and concrete pavement. This bureau is represented on three committees of the Federal Specifications Board.

Cooperation with the American Standards Association is maintained by representation on several sectional committees.

Cooperation with the asphalt industry and State highway department in preparation of specifications for liquid asphaltic products has progressed to the point where specifications involving a simplified scheme of analysis are being prepared for the consideration of the Federal Specifications Board. A cooperative project is being carried on with the Bureau of Standards to determine the visibility of different colors when used on highway signs in order to produce a manual of standard signs.

The bureau continues to cooperate with the American Society for Testing Materials on specifications for many materials used in the construction of Federal-aid highways.

#### FOOD AND DRUG ADMINISTRATION

This administration prepared and adopted definitions and standards for the following commodities: Farina, macaroni, tomato puree, tomato paste, heavy tomato paste, root beer, root beer flavor, birch beer, birch beer flavor, cream soda water, and cream soda water flavor. Revised definitions and standards were adopted for milk bread, tomato juice, mayonnaise, ginger ale, and sarsaparilla. Proposed definitions were issued for dried apricots, dried peaches, dried prunes, and apple butter, and heavy tomato puree.

**Drugs.**—(See Standards Yearbook 1932, p. 146.)

**Tea Act.**—Objective tea standards, prepared and submitted by the Board of Tea Experts, have been fixed and established for the year beginning May 1, 1932.

#### FOREST SERVICE

The Forest Products Laboratory, Madison, Wis., of the Forest Service, is represented on the following activities:

**American Standards Association.**—The ladder code committee revised the "Safety Code for the Construction, Care, and Use of Ladders."

**American Wood-Preserver's Association.**—The association adopted the revised specifications prepared by the committee for nonpressure poles, nonincised method.

**Building Code Committee, U. S. Department of Commerce.**—This committee prepared a revision of the report entitled "Recommended Minimum Requirements for Small Building Construction."

**National Fire Protection Association.**—Committee on fireproofing processes. The principal objective of this committee will be to guide the development of fireproofing processes along constructive and proper lines, and eventually establish performance standards.

Other standardizing agencies served by the laboratory staff members include: American Association of Civil Engineers, American Mining Congress, American Railway Engineering Association, American Chemical Society, American Institute of Chemical Engineers, American Pulp and Paper Association, American Society of

Mechanical Engineers, American Society for Testing Materials, the Federal Specifications Board, and Technical Association of the Pulp and Paper Industry.

#### DEPARTMENT OF COMMERCE

##### AERONAUTICS BRANCH

Standards developed by the Aeronautics Branch are found in the construction and maintenance of the Federal airways system, with the essential aids to safe air navigation.

Uniformity in these aids, and in the methods of their operation, enables pilots to utilize them in any part of the United States after having learned the fundamental principles involved. Uniform practices have been established for broadcasting of weather information from radio communications stations, for directional signals from radio range beacons, and for the transmissions of the marker beacons at key intermediate landing fields. Weather data are dispatched over teletypewriter circuits in accordance with a standard formula.

Standards of competence and experience are represented by the licensing requirements for airmen. Other standards have been established through approval and licensing of aircraft and approval of engines and accessories; regulations for interstate air passenger lines; and requirements to be met by aircraft repair stations and flying schools requesting approval. Airway maps published by the Aeronautics Branch are compiled according to a standard scale, and with uniformity in significance of tints, type sizes, symbols, and method of presentation.

##### BUREAU OF THE CENSUS

###### Division of Vital Statistics

The bureau is continuing its efforts to further the use among the States of the new standard certificates of birth and death. These forms, in whole or in part, are in general use by the majority of States. It is from these certificates filed with the States that this bureau secures its transcripts for the tabulation of vital statistics, the necessity of a standard outline is difficult to overestimate.

The bureau has issued a Pocket Reference of Information on Occupations, which has been distributed among health officials, physicians, undertakers, and local registrars.

The work of preparing the new manual of Joint Causes of Death, which is based upon the Manual of the International List of Causes of Death is approaching completion.

The bureau cooperated with the National Conference on Nomenclature of Disease, and the New York Academy of Medicine in the compilation of a Standard Classified Nomenclature of Disease.

##### BUREAU OF FISHERIES

**Net Preservation.**—Efforts have been continued toward developing standard chemical preservatives, which could be used for preserving certain types of fishing nets in various waters. It has been possible to recommend certain standard formulæ or treatments from time to time for light nets and heavy nets in both fresh and salt water.

Progress has been made toward working out a standard method for the measurement of the meshes of fishing nets used in the Great



Lakes. This is especially required for gill nets upon the Great Lakes where the regulations of six States and one Canadian Province differ widely.

**Nutrition.**—The nutrition laboratory studies, the basic food value of marine products, and the effect of the various methods of manufacture on the nutritive value of such products. The work has been of much value in aiding animal husbandmen in standardizing various farm animal rations. Studies on the primary fishery products have been of aid to research workers in human nutrition in evaluating the nutritional standards of this class of foods.

**Production Methods.**—An important research activity consists in experiments designed to improve methods of manufacture and to evolve new methods or standards of production for the manufacture of fish meal, fish oil, and related marine products in order to decrease losses now encountered and to standardize methods of production and to produce a uniformly standard product of high quality.

**Standardized Methods of Food Preservation as Applied to Marine Products.**—Work in this field consists in applying the various recognized or standard practices of food preservation, such as refrigeration, canning, drying, salting, and smoking, to marine products. These studies are designed to improve methods of handling, manufacture, transportation, and storage.

#### BUREAU OF LIGHTHOUSES

An additional degree of standardization in various phases of lighthouse work has been accomplished. In perfecting the system of radio beacons, it has been found desirable, with few exceptions, to operate such signals upon a uniform time schedule, and to adopt a standard arrangement whereby three stations form a group for synchronization purposes.

In the maintenance of the buoyage system, in which standardization is already far advanced, there is an increasing use of metal buoys in place of wooden spar buoys, as such buoys render more satisfactory service. Metal buoys not only provide better visibility, but may more readily be given the shape characteristics which constitute the standard lighthouse practice. For the latter reason, top marks are being applied to wooden buoys. An arrangement has been proposed of various flashing characteristics, to differentiate between the lights on buoys marking channels, obstructions, wrecks, and fairways, and some tests along these lines are being made.

#### BUREAU OF MINES

Many of the investigations carried on by this bureau extend over several years and include the following: Methods for sampling, analysis, and testing of coal; plasticity of coal; gas, coke, and by-product-making properties of American coals; methods for determining the burning characteristics of fuels in domestic heaters; standards for permissible electrical mine equipment; mining-community health and safety work; mine-safety standards.

Below are given outlines of developments made in other projects:

**Grindability of Coal.**—Studies are being initiated on methods for determining the ease with which various coals can be ground to a size suitable for burning as pulverized coal.



**Coating of Wires with Cellulose Acetate.**—The conditions under which the coating of wires with cellulose acetate, by the aid of acetone, is accomplished, have been so standardized as to almost completely remove the hazard of explosion.

**Permissibility of Explosives.**—The bureau has developed and standardized tests to determine the relative safety of explosives for use in mining coal.

**Ignitibility.**—To further reduce the likelihood of starting forest fires, in the necessary operation of blasting within forest areas, the bureau has developed and standardized an ignitibility test to assist in the selection of explosives for use by the Forest Service.

**Flame Temperatures.**—Through the study of the characteristics of combustible mixtures, a method has been developed for the computation of the flame temperature of a complex gas mixture from the data obtained in the chemical analysis of the mixture.

**Lubricants and Liquid Fuels.**—The bureau continued its participation in the preparation of specifications by the committee on lubricants and liquid fuels of the Federal Specifications Board.

**Gases.**—Standardizing methods for measuring natural gas has continued in cooperation with the Bureau of Standards and the American Gas Association. The Bureau of Mines has developed a method of determining the potential capacity of gas wells without blowing gas to the air.

**Compressibility of Coal-in-Place.**—The joint investigations by this bureau and the Bureau of Standards to determine specifications for mine ventilating stoppings is now completed and published.

**Explosibility of Coal Dust.**—Investigations are continuing at the experimental mine on the relative explosibility of coal dust from coals from different parts of the United States and its relative ease of ignition by flame and electric sparks when fire damp is or is not present.

**Roof Conditions in Coal Mines.**—Testing of various devices is being carried on to determine specifications for a standard roof-testing device.

**Inflammability of Dusts.**—Testing is being conducted on the relative inflammability of mineral dusts of different kinds and sizes of particles.

**Accident Statistics.**—The bureau is associated with other organizations in an endeavor to establish and have generally adopted a uniform method for the preparation of statistics of industrial accidents. A tentative report entitled "American Standard for Methods of Recording and Compiling Accident Statistics: Part 1, Accident Rates," has been prepared.

**Electrical Qualities of Slate.**—The bureau cooperated with the American Society for Testing Materials in compiling a method of test for determining the electrical insulating qualities of slate. It has reached the stage of a tentative standard, D273-27T.

**Roofing Slate.**—The bureau cooperated with a committee of the Federal Specifications Board in preparing a specification for roofing slate.

#### BUREAU OF STANDARDS

For standardization activities of the Bureau of Standards, see p. 97, of Section VI.

## COAST AND GEODETIC SURVEY

Progress has been made in standardizing apparatus and technique in connection with the various activities of the survey. A feature has been the standardization of elements of instruments, in order to reduce cost, unnecessary duplication, and permit interchangeability of parts.

Attention was given to the newly developed strong motion seismographs for measuring the acceleration, amplitude, and period of earthquakes in their central region. In the field of radio acoustic ranging, tests were made on hydrographic surveys to determine the best conditions for receiving and recording under water bomb signals for the measurement of distance, as it is not yet definitely known what course through the water is followed by the sounds which actuate the recording apparatus. Experiments are being made to determine if tuning to some particular frequency will supply the necessary data.

Progress was made in correcting echo sounding readings by the application of certain rules for slope corrections, determined from theoretical consideration substantiated by an analysis of records for several years. Similar investigations regarding the velocity of sound resulted in standardization and simplification of methods used in determining positions when surveying at sea with the radio acoustic ranging method.

Of the many methods available for reducing aerial photographs to a map, the survey has standardized on the radial plotting method as the most suitable for the scale, detail, and accuracy required. The method is applicable particularly to multilens photographs, and requires a minimum of equipment.

Representatives of the survey are cooperating with the Federal Board of Surveys and Maps, and the Federal Specifications Board.

Two theodolites developed in recent years are now used as standard by the survey. One has a 9-inch circle and the other is a smaller theodolite with a 6½-inch circle.

Portable steel towers, now standardized, replace the wooden towers formerly used to elevate the instruments to clear the lines of sight between stations.

The standard gravity base station for all future gravity determinations in the United States was moved into the new Commerce Building. The standard value of gravity at the present base station is 980.113 cm/sec.<sup>2</sup>, based on the world gravity base station system at Potsdam, Germany.

The first field test was made during the year of an improved gravity apparatus designed in the survey and constructed in its shops. Field gravity determinations of standard accuracy can be made with it three times as rapidly as with the former equipment.

With respect to its surveying work, the least square adjustment of the first-order triangulation net of the United States, begun several years ago, has been completed. This adjustment involved the use of approximately 30,000 miles of arcs of triangulation, forming many closed loops. The geographic positions of the stations and the lengths and azimuths of the triangle sides resulting from this adjustment are now standard and will not be changed in the future, except for the new disturbances caused by earth movements.



The adjustment of the first-order leveling net, some 65,000 miles, of the United States and Canada, was completed in 1929, and furnished the most probable elevations for bench marks at the junctions of the lines. Since that time much progress has been made toward fitting in the sections of the net between junction points. Elevations resulting from this adjustment will be held as standard.

#### DEPARTMENT OF INTERIOR

##### OFFICE OF THE SECRETARY

**Purchasing Division.**—The following commodities have been standardized by this division: Sound-on-film equipment; pianos, upright; clothing, civilian type, including boys' and men's leather coats; furniture, steel, household; clocks; beds, general service; and stainless steel table knives.

The following existing standardized specifications have been revised: Automotive equipment (passenger and truck), cooking ranges, circulating heaters, school desks and chairs combined, composition blackboard, various items of men's, women's, and children's wearing apparel other than that mentioned above, and textiles.

##### BUREAU OF RECLAMATION

This bureau is represented on one committee of the Federal Specifications Board.

The following standardization work has been approved and is now being used by the Bureau of Reclamation: Permanent five-room cottage; 5 feet by 3 feet 6 inches cast-iron gate, heads 0 to 15 feet; 7 by 6 feet cast-iron gate, heads 0 to 15 feet; reversing switch cabinet, angle post mounting; 6 feet 6 inches by 6 feet 6 inches cast-iron shear gate, heads 0 to 15 feet; 12 to 14 feet radial gate, heads 7 to 8 feet; 20-inch diameter cast-iron manhole and steel cover; friction testing machine; copper expansion strip; 16:1 geared gate hoist, d. c. motor operated; 8:1 geared gate hoist (4 sheets); 60:1 worm gear gate hoist (3 sheets); hollow drill for rubber; roller testing apparatus; and collapsible steel gate.

Special designs for Hoover Dam, power plant and appurtenant works, Boulder Canyon project, on the Colorado River, are in preparation. (See Standards Yearbook, 1932, p. 157.)

##### GEOLOGICAL SURVEY

The survey, in cooperation with other Federal map-making agencies, is continuing the standardization of map symbols and practices through the Federal Board of Surveys and Maps, of which it is a member.

It is also continuing the standardization of the methods, instruments, and equipment used in the collection and interpretation of data relative to the water resources of the country.

The standardization of field equipment, wear-resisting materials, and interchangeability of parts is being continued.

The survey is sponsor for a sectional committee of the American Standards Association which is endeavoring to standardize bases for computing and units for expressing water-power resources for statistical use.



## OFFICE OF INDIAN AFFAIRS

The standardization of specifications of Indian Service construction includes approximately 56 branches or types of work entering into the construction of Indian Service buildings, of which approximately 20 have been standardized. It is expected that within the next year the balance of the work will be standardized.

In preparing specifications for the various branches of work, the specification writers have endeavored to so form them that they may be used on all types of construction. The technical requirements of various materials have been carefully studied, and specifications of other Government departments doing construction work have been carefully considered.

The mechanical division has endeavored to standardize, in so far as possible, every phase of its work covering the following items and groups:

- Electrical.
- Heating and central heating plants.
- Plumbing.
- Vacuum cleaning systems built into buildings.
- Cold-storage equipment.
- Dumb waiters.
- Electric passenger elevators.
- Free-standing steel water storage tank and tower.
- Equipment (valves, stokers, etc.).
- Standard forms (electrical contracts and data sheets).

The following equipment has been standardized by the medical branch:

- Ambulance basinet and stand.
- Bed, obstetric or delivery.
- Bed, and certain other furniture, for physicians' and nurses' quarters.
- Cabinet, instrument, medium size.
- Carriage, dressing, ward.
- Carriage, tray.
- Centrifuge, electric, 2-arm.
- Chair, wheel, invalid.
- Costumer.
- Desk, nurses, chart.
- Diathermy.
- Gowns, surgeons', operating.
- Lamp, mercury vapor.
- Lamp, deep therapy.
- Lamp, infra-red.
- Light, emergency, operating.
- Scale, prescription, torsion.
- Screen, bed.
- Sphygmomanometer, mercurial.
- Tank, developing, X-ray.
- Table, bedside (locker).
- Table, dining, hospital.
- Table, recreation, folding.
- Table, instrument and dressing.
- Table, operating.
- Table, treatment and examining.
- Wheel stretcher.

## DEPARTMENT OF LABOR

## BUREAU OF LABOR STATISTICS

The Department of Labor is represented on the Standards Council, the safety code, and the mining standardization correlating

committees of the American Standards Association by the Bureau of Labor Statistics.

Practically all of the American Standards Association codes which deal with safety of workers are published by this bureau. The code of lighting—factories, mills, and other work places—and safety codes for the prevention of dust explosions, were published during the past year.

The bureau seeks to promote the standardization of methods of collection and tabulation of statistics in collaboration with the various State bureaus of labor statistics.

#### CHILDREN'S BUREAU

This bureau has carried on the following activities relating to standardization:

1. Collection and compilation of uniform child welfare statistics, including—

(a) Reports on employment certificates issued to working children, compiled and published annually.

(b) Reports of juvenile court cases, compiled and published annually.

(c) Monthly reports showing volume and type of service rendered in 22 fields of social and health work.

(d) Collection and monthly publication of statistics of family relief and relief to the transient and homeless.

2. Committee work directed toward the development of standards in various fields—

(a) Development of forms, instructions, and special handbooks in connection with the registration of social statistics.

(b) Development of legislative and administrative standards for the protection of minors from industrial hazards.

(c) Publication and distribution of child labor and vocational guidance standards of the White House Conference on Child Health and Protection.

3. Special studies relating especially to the development of standards include the following—

(a) Examination of the value of salmon oil in the treatment of infantile rickets, a special investigation undertaken in connection with other studies of rickets in New Haven, and carried on in collaboration with the Bureau of Chemistry and Soils of the Department of Agriculture.

(b) Study of institutional treatment of delinquent boys in five States with a view to developing more adequate methods of treatment of delinquency.

(c) Cooperation with the Department of Justice in developing standards of treatment of the Federal juvenile offender, and the assumption of responsibility for his care by his home community.

4. Preparation and distribution of bulletins.—In addition to bulletins on maternal, infant, and child care and child management, and bulletins presenting the results of statistical compilations and special studies, the bureau issued a folder entitled "Emergency Food Relief and Child Health," and a leaflet entitled "How to Spend Your Food Money."

## WOMEN'S BUREAU

This bureau recommended certain minimum standards for places employing women, and continues to call attention to such standards and to present them to the public and interested groups in various ways. (See Standards Yearbooks for 1931 and 1932.)

Handbooks for the protection of women workers showing lighting standards and practices, and industrial injuries to women in 1928 and 1929 compared with injuries to men were published and circulated.

The bureau has prepared and issued a bulletin entitled "Standards of Placement Agencies for Household Employers," in which are included standards applicable to all sections of the country for adult workers, for workers 21 years of age or under, and for college students. These standards were collected and analyzed by the bureau in cooperation with the Federal Board for Vocational Education.

## NAVY DEPARTMENT

## OFFICE OF NAVAL OPERATIONS

This office is the agency in the Navy Department which handles correspondence with respect to the standardization of specifications, as well as matters received from the division of simplified practice of the Bureau of Standards.

The Navy Department specifications board is composed of representatives from various branches of the Navy Department and has the following functions: (a) To standardize as far as practicable the technical requirements and form of department specifications; (b) to unify as far as practicable the specifications for material used in common by two or more bureaus; (c) to expedite action on all matters relating to the issue of department specifications.

In order to insure coordination between this board and the Federal Specifications Board, the chairman is also the Navy Department representative on the Federal Specifications Board.

## BUREAU OF AERONAUTICS

During the World War, when military airplanes were being procured in large quantities, little attention was paid to standardization in view of the fact that the aeronautical industry was in its infancy. Each service, however, soon recognized the need for standardization and joint action, and shortly after the war representatives of both the Army Air Corps and the Bureau of Aeronautics met for the purpose of standardizing on materials. The results of these meetings soon became manifest, and specifications and standard drawings were prepared and used concurrently by both services. Standardization is gradually broadening to cover equipment, processes, and design requirements in addition to the class of items originally considered and to-day proves of immeasurable value not only to the military air forces of the Government, but to the aeronautical industries as well. Each standard is considered not only with a view toward its military value, but with consideration for its adaptability to com-



mercial aeronautics as well. As a result of this policy, this Army-Navy standardization is rapidly increasing in value to the Government and to commercial aeronautics.

A preliminary conference is held annually at which representatives of the Army Air Corps and the Bureau of Aeronautics discuss and agree on subjects for standardization. Work of preparing new standards and revising existing ones is undertaken immediately after the conference and the data thus prepared is forwarded to manufacturers for comment. A general conference, known as the Main Army-Navy Standards Conference, is held as soon as practicable after the preliminary conference, at which representatives of the industry are invited.

The Bureau of Aeronautics cooperates closely with the following organizations in the research and development of aircraft materials: American Standards Association, American Society of Mechanical Engineers, American Society for Testing Materials, Society of Automotive Engineers, and National Advisory Committee for Aeronautics. The bureau is represented on several committees of the Federal Specifications Board.

#### BUREAU OF CONSTRUCTION AND REPAIR

This bureau maintains contact with and is represented on the following organizations assisting in the formulation of industrial standards: Federal Specifications Board, American Standards Association, American Society for Testing Materials, Committee on Commodities of the Federal Purchasing Board, American Marine Standards Committee, the Flag Standardization Committee of the Bureau of Standards, the Cooperative Committee on Special Steels for Ship Construction, and the Army and Navy Munitions Board. It endeavors to use nationally adopted standards whenever it is possible to do so.

The bureau cooperates actively with the following organizations in its specification work: Division of simplified practice, Bureau of Standards, National Screw Thread Commission, National Lumber Manufacturers' Association, Hemp Brokers' Association, Fine Arts Commission, American Society for Steel Treating, American Paint and Varnish Manufacturers' Association, and American Welding Society.

Research, standardization, and specification work for the past year include among others, the following materials on which considerable progress has been made: Welding electrodes, nonshatterable glass, aluminum foil insulation, refrigerators (for shipboard use), wire screen cloth (corrosion resisting steel), and welding of corrosion resisting steel.

Research work which promises to aid materially in future standardization include: High tensile steel for hull construction; satisfactory chemical range for high tensile manganese rivet steels; cadmium versus zinc coating exposure tests; pipe corrosion tests (laboratory); mercerized cotton bunting; corrosion resisting steel for wash basins, ewers, etc.; rivet exposure tests in sea water; gasoline hose; and shipbottom paints.

The bureau has authorized 144 new tests, and completion of 110, including work of a strictly research nature, as well as tests of various manufacturers' materials for use in the naval service.

Nine new Navy specifications were submitted for printing, 70 Navy specifications were revised, and 161 Federal specifications were passed upon by this bureau.

#### BUREAU OF ENGINEERING

The bureau maintains its relations with other Federal departments and industry in connection with standardization through the following organizations: Federal Specifications Board, American Standards Association, American Society for Testing Materials, American Society of Mechanical Engineers, American Marine Standards Committee, National Screw Thread Commission, American Institute of Electrical Engineers, American National Committee of the International Electrotechnical Commission, Federal Purchasing Board, National Research Council, Society of Automotive Engineers, National Industrial Conference Board's Advisory Committee on the Fuel Oil Situation, National Electric Light Association, and Army-Navy Munitions Board.

The bureau has investigated, in laboratories under its control, a very considerable number of different types of apparatus, materials, and processes with a view to selecting the best available in the commercial field for standardization, methods of employment, and for the preparation of adequate specifications. In some cases investigation has just been inaugurated. Some of the investigations relate to motors and controllers, alternating current; phenolic insulation, molded and laminated; circuit breakers; switches for dead-front panels; electrical-measuring instruments for shipboard use; electrical equipment for metal arc welding; incandescent-electric lamps for shipboard use; electrical-insulating material (solid and liquid); dry batteries; and portable lead-acid batteries.

#### BUREAU OF MEDICINE AND SURGERY

During the past year 10 proposed revisions of Federal specifications were reviewed. Approximately 60 Federal specifications, or specifications complying with all the technical requirements of the Federal specifications, are being used by the Naval Medical Supply Depot at Brooklyn, N. Y. (See Standards Yearbook, 1932, p. 165.)

#### BUREAU OF NAVIGATION

The Hydrographic Office cooperates with the hydrographic services of all foreign nations and maintains complete exchange of all publications in accordance with general practice. In 1921, the International Hydrographic Bureau was established for the purpose of standardizing the practices of the hydrographic offices of the various nations. The United States is a member of the bureau and also is a member of the governing board of three.

Through the above coordinating agencies, and membership on the Board of Survey and Maps, and the United States Graphic Board, effort is constantly directed toward standardization of forms, symbols, characters, and methods of surveying, chart construction for



navigation and aviation charts, and the publication of nautical books. (See Standards Yearbook, 1932, p. 166, regarding Naval Observatory.)

#### BUREAU OF ORDNANCE

The bureau takes an active part in the work of the Navy Department specifications board, and is represented on several committees of the Federal Specifications Board. The bureau also has membership in the National Screw Thread Commission and the American Standards Association.

The bureau has adopted the system of fits and dimensions of screw threads as outlined in the report of the National Screw Thread Commission. In some cases, as in the case of projectiles, where parts on hand are assembled with new parts, a special study of the dimensions, tolerances, and gages of the old threads was necessary before threads in accordance with the new system could be adopted. Threads dimensioned in accordance with the report of the National Screw Thread Commission have a decided advantage over the old system, as an allowance may be made in the gages for wear, which, together with check gages, insure the proper fit of the threads.

#### BUREAU OF SUPPLIES AND ACCOUNTS

This bureau issued during the past year under its own cognizance approximately 129 new and revised specifications covering 30 commodities, and 99 commodities under the cognizance of other bureaus. Of these 129 specifications, 37 are new specifications and 92 are revisions of earlier specifications.

#### BUREAU OF YARDS AND DOCKS

Members of this bureau represent the Navy Department on 24 committees of the Federal Specification Board.

The bureau is also represented on a committee of the Federal Purchasing Board, and has membership on committees of the Navy Department specification board, American Standards Association, and American Society for Testing Materials.

The bureau is conducting the following research investigations:

(a) Service tests on copper-bearing steel sheet piles, electroplated reinforcing bars, concrete piles exposed to the action of sea water, and steel furniture.

(b) Service tests on putties.

(c) Service tests on nonclimable chain link 2-inch diamond mesh No. 6 galvanized copper-bearing wire fencing.

(d) Service tests on coatings used for the preservation of steel girders.

(e) Service tests on transparent waterproofing materials.

(f) Service tests on "duocrete" piles.

(g) Service tests of floor covering (bituminous carpet), and protective coatings on piles used in the construction of a pier.

(h) Service tests on paints to determine suitability for use on surfaces exposed to extreme moisture conditions.

(i) Service tests on 16-inch cast-iron pipe dredge line to ascertain the progress of abrasive deterioration.



## UNITED STATES MARINE CORPS

The Marine Corps is employing Federal specifications in all purchases where such specifications apply. The Quartermaster's Department, Marine Corps, is represented on eight committees of the Federal Specifications Board. One officer of the Marine Corps is detailed to full-time duty with that board, and considerable time is devoted to the Federal Standard Stock Catalogue by the Office of the Quartermaster.

## TREASURY DEPARTMENT

## COAST GUARD

Standardization by this service is being further developed in connection with plans for construction, the use of materials covered by Federal specifications, and by insistence that commodities not covered by Federal specifications be standard commercial articles readily obtainable in the open market. This service is encouraging investigations whereby fittings may be simplified.

The more general use of Federal specifications is being encouraged in the solicitation of proposals in lieu of detailed specifications covering particular items used heretofore.

The standards promulgated by the American Marine Standards Committee are being used by the various construction and repairing agencies of the Coast Guard with which committee this service is cooperating.

## PUBLIC HEALTH SERVICE

This service has continued its membership on, and cooperation with, the association and organizations outlined in Standards Yearbook for 1932, together with such continuing activities as are mentioned herein.

The Public Health Service program for the standardization of milk-control methods has been continued. The Public Health Service milk ordinance now carries the approval of the Bureau of Dairy Industry of the Department of Agriculture.

A Public Health Service advisory milk committee was appointed to review all future proposed modifications of the Public Health Service milk ordinance and code, and make recommendations to the Surgeon General relative thereto. The committee is comprised of representatives of the milk control bureaus of State health departments, industry, Department of Agriculture, and the Public Health Service.

The Public Health Service issued suggested specifications for the design and operation of high temperature-short time milk pasteurizers.

A plan for a morbidity reporting area has been approved by the Annual Conference of State and Territorial Health Officers in order to standardize and stimulate the reporting of communicable diseases.

This service has been engaged in studies in cooperation with the health section of the League of Nations and the International Office of Public Hygiene in Paris in standardizing practices for international usage in the fumigation of ships for the destruction of rats on board, both within the vessel's structure and in cargo, with particular reference to the use of hydrocyanic acid gas as a fumigant.

This service is cooperating with the Permanent Committee of the International Office of Public Hygiene in Paris in the standardization of the quarantine management of aircraft arriving from foreign ports, to form the basis of a proposed International Sanitary Convention for Aerial Navigation.

#### WAR DEPARTMENT

**Military Standardization.**—Information relative to standardization of military items can be found in Standards Yearbooks 1930, 1931, and 1932. The procedure for effecting this standardization has been improved and clarified and accelerated progress has resulted.

**Nonmilitary Standardization.**—In nonmilitary standardization, the War Department cooperates with the Federal Specifications Board, the National Screw Thread Commission, the division of simplified practice of the Bureau of Standards, and the American Standards Association.

The following branches of the Army have members representing the War Department on the indicated number of committees of the Federal Specifications Board: Quartermaster Corps, 50; Medical Corps, 9; Ordnance Department, 9; Chemical Warfare Service, 2; Air Corps, 4; Signal Corps, 7; and Corps of Engineers, 7.

Federal specifications now serve as purchase specifications and the War Department is gradually reducing its own commercial specifications and substituting directly the Federal specifications.

**American Standards Association.**—The War Department is a member body of the American Standards Association, and is officially represented on the association's standards council and on 42 sectional committees.

**Status of War Department Standardization and Results Accomplished During 1932—Quartermaster Corps.**—As a result of the adoption of the Federal Standard Stock Catalogue by the Quartermaster Corps, there was put into operation a uniform storage system, which standardized nomenclature, arrangement of stock, and methods of inventory and accounting.

The Quartermaster Corps Standard Stock List was published, listing all items which are considered standard. Under the general policy governing this publication, only those items were selected for standard stock that were manufactured exclusively for the Army or of which the Army consumed the greater proportion of production. The number of items carried in stock by the Quartermaster Corps has been reduced from approximately 70,000 to approximately 6,000.

Progress has been made in the adaptation to Army uses of commercial articles produced in large quantities in lieu of items heretofore produced or manufactured specially for the Army.

Sixteen new Army specifications and eight revisions were prepared and approved. Two hundred and twenty-three specifications were canceled due to promulgation of Federal specifications.

Metal meat platters and metal water pitchers are being studied with a view to their being adopted as standard, in lieu of like china items. Studies are now being made looking toward the adoption of standard commercial china and cooking utensils for permanent kitchens.



Numerous canvas items issued to the Army call for duck which has been found to no longer conform to commercial standards. Many of these items have been studied and recommendations have been made for the adoption of duck having approximately the same qualities and which conforms to simplified practice recommendations. Tests have also been directed on articles manufactured from twill, having an original cost of only a fraction of that of duck.

The Quartermaster Corps has succeeded, through coordination, in arriving at a recommendation reducing the number of lanterns to three types.

The list of hand tools used in the Quartermaster Corps is being studied with a view to having the fewest possible number of tools required.

**Ordnance Department.**—Seventeen new Army specifications have been written and nine revised.

This department, in collaboration with representatives of other Government departments and the leading gage manufacturers, has done considerable research work on the development of a series of combination ring and snap gage blanks for use on small component parts.

This department has participated in the standardization of commercial and adjustable snap gages covering the complete range of sizes, as well as plain and thread plug and ring gage blanks up to 12 inches in diameter.

Systematic tables of tolerances and wear allowances for gages, based on the amount of component tolerance, have been formulated to insure uniformity and simplification of design.

Metallographic and metallurgical research into the possibility of producing satisfactory steels for ordnance construction without the use of manganese, and an analysis of the carbon segregation in centrifugal castings was continued.

Welding research has included the investigation of the use of flash welding for the manufacturers of projectiles; tipping of high-speed tools; electrode research to improve the quality of welds; X-ray inspection of welds as a means of establishing standard welding technique.

Physical testing research has included a study of the effect of the size of tensile and impact bars on the results obtained, together with an attempt at standardizing impact machines to obtain comparable results.

Cold-working research embraced an analysis of the effect of reduction of area, as measured by physical tests and as accomplished by hammering or pressing the ingot, on the resultant cold-work effect expected in the gun forging with a view to standardizing the forging practice.

Two important developments in the field of pyrotechnics of interest to the aircraft industry have been made. Parachute landing flare, M-3, has been replaced by the M-8 aircraft parachute flare, which is hermetically sealed until brought into use, thus insuring a greatly increased life of the flare in storage or when carried on an airplane. The method of carrying on the ship has been improved with corresponding improvement in launching. An improved type of signaling equipment has been developed, and is now in use by the



Army Air Corps and other Government agencies. This consists of a pistol type of projector, capable of being loaded and fired with one hand.

The following are outstanding research projects in which considerable progress has been made: Development of improved propellants for various weapons; study of purified wood pulps for use in the manufacture of smokeless powders; study of the process for purification of nitrocellulose; improvements in process for purification of tetryl; study of hygroscopicity of explosives; development of slow-burning fuze powders; and development of methods and apparatus for the testing of primers.

**Corps of Engineers.**—Standardization activities of this corps cover certain commodities entering into the construction of highway, ponton, and foot bridges; locks, dams, revetments, floating plants, and fortification works. They also include the design and development of fixed and mobile anti-aircraft 60-inch searchlights, equipment for lumbering, mapping, railroad and road building, as well as other items used for military purposes.

This corps prepared and had nine Army specifications approved.

In addition to the above, the Office of the Chief of Engineers acted upon 42 specifications prepared by other War Department branches, and 215 specifications prepared by the Federal Specifications Board; also on 8 reports of the general conferences on simplification of commodities from the Department of Commerce, one American Institute of Electrical Engineering standard for transformers, one American Society of Mechanical Engineers standard for shaft couplings, and five tentative specifications of the American Society for Testing Materials.

**Signal Corps.**—This corps, in accordance with War Department policy, has attempted to standardize all equipment used in Army communication systems. In designing this equipment great care is exercised in an endeavor to follow the recommendations of the various standardizing agencies, especially those of the American Standards Association, and to have the resultant specifications comply with the standards of American industry.

This corps prepared 46 new, and revised 64 old War Department specifications for equipment. The following equipment projects were completed and the equipment standardized: Radio sets, types SCR-183, SCR-189, SCR-190, SCR-192; telegraph set, type TG-5; carrier, type RL-24; crank, type GC-4; wire pike, type MC-123; and headset, type HS-18.

**Air Corps.**—Sixty-two Air Corps specifications, covering various materials and equipment were revised and five new specifications were prepared and approved.

Materials and equipment applicable to military aircraft are presented for standardization at annual conferences attended by Army, Navy, and manufacturers' representatives. There were 120 subjects discussed at the last annual conference, of which 97 were approved. The publication of data pertaining to these standard subjects included the preparation and issuance of 63 specifications and 57 drawings.

This corps assisted in the standardization of specifications prepared by other branches of the Army and those prepared by the Fed-

eral Specifications Board. This corps adopted 264 specifications prepared by other branches of the Army and 142 Federal specifications.

Among major projects of special interest is a specification for wood-pulp wadding which is to be used as a substitute for jute packing felt, and specifications covering a complete range of sizes of streamline wheels which have passed the experimental tests and are now undergoing service test in tactical units on items of standard equipment.

**Medical Department.**—Standardizing activities were largely confined to revision of the Medical Department supply catalogue which was completed. Seven specifications covering 39 items were completed and approved during the year.

**Chemical Warfare Service.**—Thirteen important items reached a stage of development where tentative specifications were written and either service tests authorized and are under way or authority has been granted for limited procurement. Eight specifications were completed and two revised specifications were prepared and cleared for procurement.

**Coast Artillery Corps.**—A portable signal conductor mine system has been standardized for purchase and use only in event of emergency.

This corps has been particularly active in the refinement of specifications for single conductor mine cable, and in the development and test of improved firing devices for submarine mines.

**Bureau of Insular Affairs.**—(See Standards Yearbook, 1930.)

## INDEPENDENT ESTABLISHMENTS

### COMPTROLLER GENERAL OF THE UNITED STATES

The General Accounting Office has continued work in the standardization of accounting forms and procedure for the Government service. The following forms and procedure have been prescribed:

**Schedule of Civil Service Retirement and Disability Fund Credits.**—Standard form 1070 is used in connection with the accounts of disbursing officers of the Government for showing in convenient form retirement deductions made on pay rolls and vouchers, retirement collections received from persons reentering the Government service or for the purchase of service credit, and deposits of same to the credit of the retirement fund.

**Mileage Voucher.**—Standard forms 1071 and 1071A are for use of the six services embraced in joint service pay act of June 10, 1922, in securing payment for travel on official business at the mileage rate fixed by law.

**Per Diem, etc., Pay Rolls.**—The standard forms of the 1072, 1073, and 1074 series are for use in making payments on account of services of Government employees working on a per hour, day, week, month, or piece-work basis.

**Loose Cash Receipt and Special Per Diem, etc., Payment Subvoucher.**—Standard forms 1075 and 1076 are intended for use in connection with standard forms 1072, 1073, and 1074.

**Special Salary Payment.**—The use of standard form 1018 by disbursing officers in Washington in making payments to employees on a monthly or annual salary basis before the pay roll covering the



period has been stated, certified, and approved, was extended to disbursing officers in the field services of the Government.

**Extension of Uniform Accounting System.**—The use of standard bookkeeping forms and procedure for appropriation and disbursing office accounting has been extended in the following Government activities: State Department; Departments of Agriculture, Justice, Treasury, Interior, and Commerce; Columbia Institution for the Deaf; George Washington Bicentennial Commission; Civil Service Commission; and Veterans' Administration.

Surveys of accounting systems and procedure have been made during the year for the purpose of establishing uniform accounting systems in the government of the District of Columbia and Federal governmental agencies.

#### FEDERAL COORDINATING SERVICE

##### Office of Chief Coordinator

This office, with the assistance of the Bureau of Standards, continued its efforts to secure standardization of telephone service and to promote operating economy through the consolidation of private branch exchange telephone switchboards in Federal buildings outside the District of Columbia housing two or more Government activities. Field telephone traffic surveys were conducted and recommendations for consolidation made in a number of localities.

##### Federal Purchasing Board

This board has continued its policy and efforts toward standardizing and coordinating the procurement policies in connection with the purchase of articles common to two or more departments or establishments. This has been especially true with respect to medical and hospital supplies, and other commodities are being studied.

The subject of standard and uniform legislation regarding the debarment of unsatisfactory bidders for Government business is now being studied, and it is hoped that this may be in final form for presentation to Congress at the next session.

This board, through its chairman, has taken an active part in establishing the standard nomenclature and practices of the Federal Standard Stock Catalogue in the various executive departments and independent establishments.

##### Federal Specifications Board

During the past year this board has promulgated 55 new Federal specifications, 250 revisions, and 7 suspensions and cancellations, making a total of 780 specifications. The new specifications and some of the revised specifications issued are as follows:

##### New specifications:

F. S. symbol

C-G-191. Gelatin.

C-G-451. Glue, animal (for) wood-working.

G-M-111. Mats, lantern slide.

H-B-56. Brooms, fiber.

N-C-191. Cereals (breakfast foods).

N-N-591. Noodles.

T-T-901. Twine, hemp.

F. S. symbol

V-T-276. Thread, cotton.

V-T-301. Thread, silk.

Y-O-451. Olives.

Z-A-616. Apple butter.

Z-B-421. Blackberries, canned.

Z-B-491. Blueberries (huckleberries), canned.

Z-B-661. Grape juice.



## F. S. symbol

Z-L-501. Loganberries, canned.  
 Z-P-491. Plums, canned.  
 Z-P-631. Preserves, fruit.  
 Z-R-91. Raspberries, canned.  
 AA-C-121. Cases, transfer, steel.  
 EE-B-671. Bread, and rolls.  
 EE-C-71. Candy.  
 EE-G-391. Ginger ale.  
 EE-M-821. Mustard, prepared.  
 EE-Y-131. Yeast.  
 GG-W-111. Watches, stop.  
 PP-H-91. Hash, corned-beef, canned.  
 PP-S-311. Shrimp, canned.  
 RR-R-191. Receptacles, waste-paper, metal, office and lobby.  
 SS-A-676. Asphalt, emulsion, quick-breaking type (for road work).  
 SS-S-721. Stone, architectural, cast.  
 SS-C-621. Concrete units, masonry, hollow.  
 UU-P-416. Paper, photographic, black line.  
 UU-P-417. Paper, photographic, blotting, white.  
 UU-P-418. Paper, photographic, negative.  
 WW-C-623. Couplings, hose, garden and water.  
 WW-C-636. Couplings, hose, steam.

## F. S. symbol

WW-P-448. Pipe fittings, brass or bronze (threaded), 125-pound.  
 WW-P-461. Pipe fittings, bronze (threaded), 250-pound.  
 WW-T-806. Tubing, electrical, metallic.  
 CCC-C-406. Cloth, awning.  
 CCC-C-451. Cloth, handkerchief, cotton.  
 DDD-B-421. Blankets, cotton, and cotton-warp and wool-filling.  
 DDD-H-71. Handkerchiefs, cotton.  
 DDD-L-391. Linen, table (doilies, napkins, and tablecloths).  
 DDD-R-751. Rugs, American-oriental (washed).  
 GGG-A-926. Axes.  
 GGG-K-486. Knives, putty, and scraping.  
 JJJ-C-21. Cabbage, canned.  
 JJJ-C-76. Carrots, canned.  
 JJJ-C-91. Catsup, tomato.  
 JJJ-M-851. Mushrooms, canned.  
 JJJ-P-391. Pickles and relishes.  
 JJJ-P-611. Potatoes, sweet, canned.  
 JJJ-S-581. Soups, canned.  
 JJJ-S-661. Squash, canned.

## Revised specifications

## F. S. symbol

C-B-801. Butter.  
 C-C-271. Cheese, American (cheddar or American-cheddar).  
 C-C-671. Cream, fresh.  
 C-E-271. Eggs.  
 C-F-201. Feit, hair.  
 C-M-341. Milk, dry, malted.  
 C-M-371. Milk, evaporated.  
 C-M-381. Milk, fresh.  
 N-B-121. Barley, pearl.  
 N-C-501. Corn, canned.  
 N-C-521. Corn meal (white or yellow).  
 N-C-541. Cornstarch.  
 N-F-451. Flour, buckwheat.  
 N-F-461. Flour, graham (whole-wheat meal).  
 N-F-481. Flour, wheat.  
 N-H-521. Hominy grits.  
 N-M-51. Macaroni, spaghetti, and vermicelli.  
 N-O-41. Oatmeal and rolled (or flaked) oats.  
 N-R-351. Rice.  
 N-T-101. Tapioca.  
 O-F-355. Fire extinguishers, chemical, hand (soda-and-acid-type).  
 O-M-571. Mono-methyl-p a r a m i n o - phenol sulphate.  
 R-T-101. Tar, cold application (for roads).

## F. S. symbol

R-T-121. Tar, refined, construction (for roads).  
 R-T-131. Tar, refined, hot application (for roads).  
 R-T-141. Tar, repair work (for roads).  
 T-R-571. Rope, cotton.  
 U-A-451. Alloy, dental, amalgam.  
 W-B-101. Batteries and cells, dry.  
 W-F-801. Fuses, cartridge, inclosed, renewable.  
 W-L-101. 1933 supplement, lamps, electric, incandescent, large, tungsten-filament.  
 W-L-111. 1933 supplement, lamps, electric, incandescent, miniature, tungsten-filament.  
 Z-A-611. Apples, canned.  
 Z-A-613. Apples, evaporated (or dried).  
 Z-A-621. Applesauce, canned.  
 Z-A-631. Apricots, canned.  
 Z-A-636. Apricots, evaporated (or dried).  
 Z-C-301. Cherries, canned.  
 Z-C-851. Currants, dried.  
 Z-J-71. Jams, fruit.  
 Z-J-191. Jellies, fruit.  
 Z-O-351. Oil, olive (edible grade).  
 Z-P-191. Peaches, canned.  
 Z-P-193. Peaches, evaporated (or dried).

## F. S. symbol

Z-P-201. Pears, canned.  
 Z-P-351. Pineapple, canned.  
 Z-P-671. Prunes, canned.  
 Z-P-681. Prunes, evaporated (or dried).  
 Z-R-71. Raisins.  
 Z-V-401. Vinegar.  
 AA-C-31. Cabinets, stationery, storage, and clothing (steel).  
 AA-D-191. Desks, steel.  
 AA-S-81. Safes, insulated.  
 AA-T-101. Tables, and typewriter stands, wood.  
 DD-G-451. Glass, flat for glazing purposes.  
 EE-C-651. Crackers, soda.  
 EE-L-101. Lard substitutes (including shortening, vegetable).  
 FF-B-571. Bolts, nuts, studs, and tap rivets (and material for same.)  
 FF-S-111. Screws, wood.  
 FF-T-311. Thumb tacks.  
 GG-I-531. Instruments, drawing (first grade, in sets).  
 GG-M-191. Measuring devices, liquid (retail type).  
 GG-T-321. Thermometers, industrial.  
 GG-T-711. T squares.  
 HH-C-571. Cork, granulated, insulating.  
 HH-G-71. Gaskets, asbestos - copper, corrugated.  
 HH-G-76. Gaskets, asbestos, metallic cloth.  
 HH-M-51. Magnesia, asbestos, plaster.  
 HH-M-71. Magnesia, block, pipe covering (molded).  
 HH-M-351. Millboard, asbestos.  
 HH-P-31. Packing, asbestos, metallic cloth, sheet.  
 HH-P-41. Packing, asbestos, rope and wick.  
 HH-P-61. Packing, diaphragm.  
 HH-P-91. Packing, fiber, hard, sheet.

## F. S. symbol

HH-P-106. Packing, flax.  
 HH-P-151. Packing, rubber, cloth insertion.  
 HH-P-156. Packing and gaskets; rubber, molded, sheet, and strip.  
 HH-P-171. Packing, spiral, gland, low pressure.  
 HH-P-181. Packing, tucks.  
 JJ-N-191. Netting, mosquito (unbleached bobbinet).  
 OO-L-131. Laundry appliances.  
 PP-B-81. Bacon, smoked.  
 PP-B-201. Beef, corned, canned.  
 PP-B-211. Beef, dried, sliced, canned.  
 PP-B-221. Beef, fresh.  
 PP-C-251. Chickens, dressed (broilers, fryers, and roasters).  
 PP-C-401. Clams, fresh.  
 PP-C-651. Crab meat, canned.  
 PP-C-656. Crab meat, fresh.  
 PP-F-371. Fish, flaked, canned.  
 PP-F-381. Fish, fresh.  
 PP-F-401. Fish, salted or smoked.  
 PP-F-611. Fowl, dressed (fricassee).  
 PP-H-71. Hams, sweet-pickle cured, smoked.  
 PP-H-201. Hearts, beef.  
 PP-K-351. Kidneys, beef.  
 PP-L-101. Lard.  
 PP-L-351. Liver.  
 PP-M-791. Mutton.  
 PP-O-956. Oysters, fresh.  
 PP-S-31. Salmon, canned.  
 PP-S-51. Sardines, canned.  
 PP-S-71. Sausage, bologna-style.  
 PP-S-81. Sausage, frankfurter-style.  
 PP-S-91. Sausage, pork.  
 PP-S-101. Sausage, Vienna - style, canned.  
 PP-T-571. Tongue, beef, canned.  
 PP-T-791. Turkeys, dressed.  
 QQ-C-501. Copper, bars, plates, rods, shapes, sheets, and strips.

Two hundred and twenty-three proposed specifications and revisions were circulated to Federal departments for comment and criticism.

## Federal Standard Stock Catalogue Board

The compilation of the Federal Standard Stock Catalogue has proceeded satisfactorily and all of the classes of Section II, part 6, except six, have been issued. Several hundred Federal specifications have also been printed and issued. The catalogue has been adopted and is in full effect in the Quartermaster Corps, United States Army, and Supply Corps, United States Navy. The General Schedule of Supplies for 1933 contains the nomenclature and stock numbers of the Federal Standard Stock Catalogue, making it a practical reference book which all activities can utilize intelligently. Other departments and establishments of the Government are gradually

adopting the catalogue nomenclature, stock numbers, etc., and the methods of storage described in the catalogue. (See Standards Yearbook 1932, p. 183.)

#### Federal Statistics Board

Standardizing activities of the board are related chiefly to the following subjects:

(a) Technical statistical methods as related to (1) improved methods in the collection, publication, and utilization of statistics; (2) promotion of standardized practice in nomenclature, base period for index numbers, grouping of years in period averages, number of significant forms shown in tables, and the like; (3) promotion of comparability between American and foreign statistics.

(b) Clerical and mechanical methods as related to (1) promotion of economy in the clerical operation of tabulating statistics, and the comparison of relative advantages of machine and hand processes; (2) furthering of efficiency and economy in the publication of statistical documents in such matters as methods of reproduction, style of page and type, and the like.

This board has been active in forming policies and making an extensive survey of the statistical work of Government agencies. At the present time the statistical work of one organization is being carefully analyzed for the purpose of standardizing clerical and mechanical methods.

#### Federal Traffic Board

This board succeeded in obtaining special concessions from airplane companies throughout the United States providing for transportation of Federal employees at rates under their usual commercial charges.

The office of this board has routed during the year a total of 31,931 carloads of Government freight.

#### Interdepartmental Board of Contracts and Adjustments

The Interdepartmental Board of Contracts and Adjustments has been working on a proposed revision of the standard contract forms; also upon a proposed uniform contract law.

#### Interdepartmental Board on Simplified Office Procedure

This board has continued its work of standardizing the use of office supplies, material, and equipment, and the classifying, simplifying, and standardizing of routine administrative functions common in two or more departments or establishments.

**Envelopes.**—The board was represented on the special interdepartmental committee which considered specifications of envelopes to be included in the Post Office Department schedule of envelopes.

**Standard Forms.**—A revision of Standard Form No. 44, Government Motor Fuels Tax Exemption Certificate, has been adopted.

**Correspondence Manual.**—The proposed correspondence manual to be used as a guide in preparing correspondence in the Government departments and establishments is now ready for submission to them for their comments.



**Telephone Listing.**—The board prepared instructions regarding the procedure to be followed in listing all Government activities in commercial telephone directories in the field as well as in Washington, D. C.

**Publications.**—The board approved a recommendation to change the size of proclamations and Executive orders to the standard letter size.

#### Permanent Conference on Printing

This organization continued to carry forward its task of investigating and proposing uniform standards, businesslike methods, and proper economies in the printing and binding and distribution of Government publications.

The paper specifications committee of the Joint Committee on Printing exercised its function of determining standards and preparing specifications for paper for public printing and binding.

#### FEDERAL TRADE COMMISSION

The Federal Trade Commission contributes to the standardization of certain trade practices, particularly as a result of its trade-practice conferences. It receives trade-practice rules adopted by different industries covering practices commonly prevalent. It approves certain of the rules which condemn practices violative of the law and encourages their observance. (See Standards Yearbook 1932 report.)

Standardization may be described as a by-product of the commission's work rather than as a regular function, as most of the commission's work pertains to individual cases involving various unfair methods of competition.

#### GOVERNMENT PRINTING OFFICE

The Government Printing Office continued its research in connection with printing and binding materials in cooperation with the organizations listed in Standards Yearbook for 1932. It also continued its membership on and cooperation with the standardizing and specification-making agencies, also covered in the above document.

#### NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

**Standard Nomenclature for Aeronautics.**—This committee is proceeding with the revision of its standard nomenclature for aeronautics. A special conference has been organized for this purpose, including in its membership representatives of the Army Air Corps, the Bureau of Aeronautics of the Navy, the Aeronautics Branch of the Department of Commerce, the Bureau of Standards, and this committee.

The nomenclature adopted by this committee is for the purpose of securing greater uniformity and accuracy in the use of terms relating to aeronautics.

**Standard Atmosphere for Tests of Aircraft Engines.**—This committee adopted a table of standard atmosphere for tests of aircraft engines, which included values for standard humidity. The table adopted had been prepared by the Bureau of Standards as a result

of information obtained in an investigation conducted by that bureau on the effect of humidity on engine performance, and was recommended to the National Advisory Committee by its committee on power plants for aircraft.

This standard table has since been officially adopted by the War and Navy Departments, on recommendation of the National Advisory Committee, and will be included in the airworthiness requirements of the regulations of the Department of Commerce for aircraft engines.

#### NATIONAL SCREW THREAD COMMISSION

Standards are under consideration for threads for gas-cylinder valves, and an 8-pitch thread series ranging from 1 to 6 inches in diameter for use primarily on pipe-flange bolts. Changes in the following items covered in the 1928 report of the commission have been tentatively adopted or are being seriously considered for adoption: (a) The addition of certain sizes to the American national coarse, fine, and 12-pitch thread series. (b) Revisions of the class 4, close fit; small hose-coupling threads; bolt-head and nut dimensions; the measuring pressure for wire measurements of thread gages; and dimensions of pipe-thread gages.

#### PANAMA CANAL

The Panama Canal is represented on a number of committees and executive committee of the Federal Specifications Board, and the American Standards Association.

The Panama Canal uses Navy specifications to quite an extent for materials not covered by Federal specifications. Use is also made of specifications of other departments of the Government. When no Federal or Navy specifications exist meeting the necessary requirements, the Panama Canal drafts its own specifications, unless some other suitable existing specification is found.

#### PUBLIC BUILDINGS AND PUBLIC PARKS OF THE NATIONAL CAPITAL

This establishment is represented on the following organizations: Interdepartmental Board of Contracts and Adjustments, Interdepartmental Board of Simplified Office Procedure, Federal Purchasing Board, Interdepartmental Committee on Fire Prevention and Protection (Fire Hazards Group), Federal Specifications Board and committees, and General Supply Committee.

The design section of this establishment has continued standardizing those portions of specifications for construction projects which are applicable to practically all the construction jobs handled by this office.

#### SMITHSONIAN INSTITUTION

Satisfactory comparison of silver disk pyrheliometers was made by a representative of this institution at the Meteorological Observatory at Potsdam, Germany. These comparisons connected the scales of measurement prevailing in Europe and the United States. There was constructed at the Smithsonian shop a new standard water flow pyrheliometer much improved over the former type, and there was made at Mount Wilson highly satisfactory comparisons with the silver disk pyrheliometer used in Germany. The results



are believed to fix the standard scale to within one-tenth of 1 per cent, and are available to standardize instruments sent out from the Smithsonian Institution. Over 60 silver disk instruments carrying the Smithsonian scale have been prepared for observatories and energetic workers in this line in all continents of the world.

#### UNITED STATES BUREAU OF EFFICIENCY

The Bureau of Efficiency cooperated with the Bureau of Standards in further research to establish standard conditions, methods, and equipment for testing paper, especially paper used in the manufacture of Government securities and currency.

#### UNITED STATES CIVIL SERVICE COMMISSION

A study having as its objectives increased uniformity of examination announcements and standardization of requirements for like positions throughout the service is being made.

Another project leading toward improved personnel practices, in which the commission is engaged, is a survey of all professional and scientific employees and the preparation of charts showing comparisons of progress made by individuals in each of the major professional fields.

These charts will also furnish data upon which to base comparisons of relative possibility of advancement in the various departments and bureaus. Study of the data will indicate where promotion and transfer lines should be developed.

The Council of Personnel Administration undertook as one of its first projects a study of present Federal personnel methods and the duties and responsibilities of personnel officers, with the object of developing and introducing comparable systems of personnel administration throughout the departments.

The results of the study indicate that there are marked differences among the departments in (1) the personnel activities themselves, (2) the precedures followed in accomplishing similar purposes, and (3) the responsibilities of individuals conducting these activities.

On the basis of its survey, the council has developed a plan of organization which definitely places the final responsibility for personnel and business policies, in each department, on one permanent employee who is directly responsible to the secretary of that department.

#### UNITED STATES EMPLOYEES COMPENSATION COMMISSION

The commission has conducted a program to interest the maritime shipping industry in adopting a uniform safety code for stevedoring operations to supplant the several port and district codes already adopted. In furtherance of this program the commission published a comparison of the different port rules as a basis for studies in the preparation of a uniform code, and the American Steamship Owners Association undertook to sponsor this project on behalf of that section of the industry. The commission has continued its efforts to secure the adoption of a standard uniform code and to reconcile the conflicting views of interested groups in the different ports and sections concerning the form and scope of the



proposed uniform code. While this has been difficult in some respects, due to the variety of problems and interests involved, nevertheless, evident progress has been made.

#### UNITED STATES SHIPPING BOARD

This board is charged by the merchant marine act with promoting an efficient American merchant marine. The board has continued to support and to take part in the studies and experiments to select and develop improvements that may be recommended as standards. Much of this work has been done in cooperation with the American Marine Standards Committee.

The work under this board during the year relating to standardization has been cooperation with other marine interests in determining, from operating experience and special tests, arrangements and things that are worthy to be recommended as standards. The work has included taking part in preparation for international conferences on marine matters and in support of the safety convention, the development of practices under that convention, as well as under the load line convention, that will secure their benefits to our shipping in the largest measure.

#### VETERANS' ADMINISTRATION

The research subdivision of the Medical and Hospital Service has been standardizing the diagnostic and therapeutic methods pertaining to certain diseases, such as malignancy, diabetes mellitus, etc.

A study of cancer was conducted for the purpose of standardizing various diagnostic and therapeutic measures in order to establish ideal policies of treatment of ex-service men with malignant disease. As a result of the study it was decided that the cancer clinic at Hines, Ill., be enlarged and that a standardized method of administering X ray and radium be used at that cancer clinic.

Steps have been taken to standardize the clinical laboratory work of the hospitals and regional offices of this administration so that the procedures and the interpretation of laboratory findings would be uniform.

Studies on hospital costs and ratios of personnel to patients were recently completed. These studies were conducted with the idea of standardizing the cost of hospital administration.

The Medical and Hospital Service has just recently promulgated a standard list of drugs, pharmaceutical reagents, and biological supplies.

## VI. BUREAU OF STANDARDS

An outline of the origin and functions of the bureau is given in the 1927 Standards Yearbook. Circular No. 1 and the 1932 annual report of the director should be consulted for a more comprehensive survey of the bureau's work.

### RELATION TO GOVERNMENTAL AGENCIES

The relation of the bureau to the various governmental, Federal, State, and municipal agencies is outlined briefly in the 1927 Standards Yearbook.

### RELATION TO SCIENCE, COMMERCE, AND INDUSTRY

#### PUBLICATIONS

The results of the bureau's work are made available in printed publications. Approximately 2,500 pamphlets have been issued to date. Releases to the daily press give briefly the more important features of the bureau's activities from a popular point of view. More detailed abstracts are prepared for the use of scientific and technical journals. The results of original investigations in science and technology are reported in full in the Bureau of Standards Journal of Research, which is issued once a month, and is obtainable on a subscription basis. Compiled technical or administrative matter is issued as a circular; for example, the standard petroleum oil tables, properties of zinc and its alloys, test procedure, recommended specifications, and the like. Codes and reference texts, such as the codes of electrical practice, and lightning protection, and the manual for weights and measures officials, which must be carried about by the user, are issued in a series of pocket-size handbooks.

The program for the simplification of commercial practice leads to definite proposals known as Simplified Practice Recommendations, while agreements on the desirable minimum quality of products are published as Commercial Standards. Pamphlets on house construction, plumbing codes, zoning regulations, etc., are placed in a special building and housing series. Charts, conference reports, and material not suitable for other series appear as miscellaneous publications.

The bureau's Technical News Bulletin is a monthly periodical containing progress reports of work in the laboratories, brief data on completed investigations, which will later be reported in full in the Journal of Research, notices of important conferences, and lists of all new publications by members of the staff in the bureau's series and in technical journals.

The Commercial Standards Monthly reviews progress in the field of commercial standardization, both at the bureau and elsewhere.

Special articles by leaders in commercial standardization are a valuable feature, and brief references are also given to some of the bureau's technical work.

Mimeographed letter circulars on specialized subjects are also prepared to answer inquiries by mail. In addition to the Government publications, papers on subjects within the respective specialties are printed in outside journals, 150 such articles having appeared during the year.

The printed publications of the bureau are sold by the Superintendent of Documents, Government Printing Office, Washington, D. C. Subscriptions may be placed in advance for the *Journal of Research*, the *Technical News Bulletin*, and the *Commercial Standards Monthly*. The bureau issues a descriptive list (Circular No. 24 and supplement) of its published material. Announcement leaflets giving titles of all new publications in the bureau's series are sent on request to interested individuals.

## RESEARCH AND TESTING

### RESEARCH

Research on problems arising in connection with standards is by act of Congress a primary function of the bureau. Such work includes the devising of methods and apparatus for the precise measurement of standards, the frequent intercomparison of standards to determine their permanency, and the evaluation of standards by absolute methods.

**Research Associates.**—Much of the bureau's research is directed to the application of science in commerce and industry. The research associate<sup>1</sup> plan permits industrial associations or groups to place qualified men at the bureau for intensive study of selected problems approved by the Director of the Bureau of Standards. Such men utilize the bureau's laboratory facilities and equipment and have the same status as any bureau employee except that their salaries are paid by the supporting group or association.

The work of a research associate on problems of concern to an entire industry is one of peculiar trust. Research results are immediately available to the industry concerned and are frequently printed in bureau publications. Devices or processes developed during research may not be patented for the benefit of the individual or the group, but are for the free use of the industry, the Government, and the public. Correspondence relating to the work of the research associate is conducted through official channels except on purely personal matters.

A list of the research associates and projects under investigation arranged according to sustaining organizations is given in the following table:

---

<sup>1</sup> For further details, see B. S. Circular No. 296.



*Research associates*

[This table contains the name of every research associate on duty at the Bureau of Standards during the period from January 1 to October 15, 1932, inclusive. Necessarily, it is not correct as of any one date, since many of these associates were assigned to the bureau for only part of the period covered]

Assigned by—	General field of research	Specific project	Research associate
Aluminum Co. of America, New Kensington, Pa.-----	Engineering structures.	Fatigue of alclad duralumin-----	Gough, C.
American Association of Textile Chemists and Colorists, L. A. Olney, chairman, research committee, Lowell, Mass.	Textiles-----	Action of light on silk; determination of isoelectric points of wool and silk; studies of dye absorption. Development of standards for fastness of dyed textiles; aging test for waterproofed fabric; action of light on cotton-----	Harris, M.  Smith, Wm. C.
American Dental Association, 212 East Superior Street, Chicago, Ill.	Dentistry-----	Study of dental materials-----	Paffenbarger, G. C.; Sweeney, W. T.
American Electroplaters' Society, 434 South Wabash Avenue, Chicago, Ill.	Electroplating-----	Protective coatings-----	Strausser, P. C. W.
American Foundrymen's Association, Cleveland, Ohio-----	Metallurgical-----	Liquid shrinkage in metals-----	Ash, E. J.
American Gas Association, 342 Madison Avenue, New York, N. Y.	Gas engineering-----	Gas burner design-----	Veritt, C. J.
American Institute of Steel Construction, 200 Madison Avenue, New York, N. Y.	Soil corrosion and protective coating-----	Testing proprietary pipe-line coatings; study of methods for identifying corrosive soils. Formed sheet-steel floors-----	Ewing, S.  Frankland, J. M.
American Petroleum Institute, 250 Park Avenue, New York, N. Y., in cooperation with National Automobile Chamber of Commerce, 386 Madison Avenue, New York, N. Y.; and Society of Automotive Engineers, 29 West Thirty-ninth Street, New York, N. Y.	Engineering structures----- Fire resistance----- Fuels and engines-----	Fire tests of welded steel floor construction----- Cooperative fuel research (relationship between automotive engines and fuels)-----	Welch, C. W.; Lewis, R. M. Carter, F. R.; Gary, R. B.; Hicks, R. W.; Moltor, J. C.; Querfeld, D. W.; Rodgers, G. C.; Wood, M. K.
American Petroleum Institute, 250 Park Avenue, New York, N. Y.	Petroleum-----	Chemical constituents of petroleum-----	Barron, H. A.; Bruun, J. H.; Glasgow, A. R.; Leslie, R. T.; Mair, B. J.; Rose, F. J.; Schickel, S. I.; Schoonover, P.; White, J. D. Scott, G. N.
American Society of Mechanical Engineers, 29 West Thirtieth Street, New York, N. Y.	Soil corrosion and protective coatings----- Lubrication----- Steam tables-----	Engineering principles in pipe-line protection; tests of protective coatings. Thermal properties of water-----	McKee, T. R. Ginnings, D. C.; Osborne, N. S.; Stinson, H. F.
American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa.	Wire rope----- Structural materials-----	Strength of rope removed from service----- Research in cement, testing, etc.-----	Olson, A. Dwyer, J. R.; Messimer, L. A.; Wagner, L. A.
Asphalt and Mastic Tile Association, L. C. Hart, secretary, care of Johns-Manville Co., 292 Madison Avenue, New York, N. Y.	Flooring materials-----	Physical properties of asphalt and mastic floor tile-----	McBurney, J. W.

## Research associates—Continued

Assigned by—	General field of research	Specific project	Research associate
Asphalt Shingle and Roofing Institute, 2 West Forty-fifth Street, New York, N. Y.	Asphalt and asphalt roofing.	Durability of felt.	Strieter, O. G.
Atlas Lumnite Cement Co., 135 East Forty-second Street, New York, N. Y.	Cement.	Research in cement, testing.	Rapp, Paul.
Brown Co., Berlin, N. H.	Paper.	Preservation of records.	Rasch, R. H.
C. F. Brush Estate, Cleveland, Ohio.	Heat measurement.	Spontaneous generation of heat.	Harrington, E. A.
Bunting Brass & Bronze Co., 715 Spencer Street, Toledo, Ohio.	Metallurgical.	Testing of bronze.	Eggenschwiler, C. E.
Bureau of Efficiency, Washington, D. C.	Paper.	Improvement of paper currency.	Hamill, G. K.; Worthington, V.
Calcium Chloride Association, H. F. Clemmer, acting adviser, Washington, D. C.	Concrete.	Reaction of calcium chloride on Portland cement.	Foster, W. D.; Rapp, Paul.
Carbide & Carbon Chemical Co., 30 East Forty-second Street, New York, N. Y.	Antifreeze solutions.	Thermal properties of liquids.	Gary, F. B.
Cast Iron Pipe Research Association, 566 Peoples Gas Building, Chicago, Ill.	Soil corrosion and protective coatings.	Strength of corrosion products of cast iron; location of corrosive soils; statistical study of Bureau of Standards' data on corrosion of cast iron.	Grodsky, V. A.
Chemical Foundation, 645 Madison Avenue, New York, N. Y.	Physics.	Absolute viscosity of water.	Coe, J. R., Jr.
Common Brick Manufacturers' of America, 2121 Guarantee Title Building, Cleveland, Ohio.	Structural materials.	Moisture transmission of brick walls.	McBurney, J. W.
Commonwealth Fund Fellowship, 41 East Fifty-seventh Street, New York, N. Y.	Fuels and engines.	Strength of reinforced brick masonry.	Petrenko, E. S.
Copper and Brass Research Association, 25 Broadway, New York, N. Y.	Metallurgical.	Combustion in engine cylinder.	Steele, S.
Cordage Institute, J. S. McDaniel, secretary, 60 East Forty-second Street, New York, N. Y.	Textiles.	Corrosion of copper roofing materials.	Kosting, P. R.
Elevator Safety Code Committee, subcommittee on research, approval and interpretation, care of American Standards Association, 29 West Thirty-ninth Street, New York, N. Y.	Safety engineering.	Color of manila rope.	Becker, Genevieve.
Fixed Nitrogen Research Laboratory, Department of Agriculture, Washington, D. C.	Low temperature calorimetry.	Elevator safety equipment; development of methods and instruments; construction maintenance, operation, etc.	Brown, L. W.; Dickinson, J. A.; Sequist, W. H.
Hoskins Manufacturing Co., 4444 Lawton Avenue, Detroit, Mich.	Prometry.	Specific heats at low temperature.	Nelson, R. A.; Southard, J. C.
Institute International du Froid, 9 Avenue Carnot, Paris, France.	Heat measurement.	Thermocouple standardization.	(Vacant)
Johns-Manville (Inc.), Manville, N. J.	Heat transfer.	Properties of carbon dioxide.	(Vacant during the present year.)
Masonry Mortar Research Fellowship, L. B. Reiney, chairman, Continental Clay Products Corporation, Pittsburgh, Pa.	Structural materials.	Heat transfer between solids and fluids.	Kennard, R. B.
Midvale Co., Philadelphia, Pa.	Metallurgical.	Investigation of mortars for masonry.	Palmer, L. A.; Parsons, D. A.
National Association of Hosiery and Underwear Manufacturers, Earl Constantine, managing director, 468 Fourth Avenue, New York, N. Y.	Textiles.	Properties of metals at high temperatures.	Kahlbaum, W.
		Cause and prevention of defects in hosiery; development of specifications, analysis of hosiery manufacturers' problems.	Schenke, E. M.; Shearer, H. E.

National Cinder Concrete Products Association, 1600 Arch Street, Philadelphia, Pa.	Structural materials	Concrete buildings units	Bowen, E. E. W.
National Research Council, Washington, D. C.	{ Paper	Preservation of records	Emley, A. L.; Holt, W. L.; Kimberly, A. E.; Stone, G. O.
Nonferrous Ingot Metal Institute, 308 West Washington Street, Chicago, Ill.	{ Sound	Acoustic properties of building materials	Miller, C. E.
Portland Cement Association, 33 West Grand Avenue, Chicago, Ill.	Metallurgical	Nonferrous ingot metal research	Gardner, H. B.
Radiological Research Institute, Beaumont Building, St. Louis, Mo.	Structural materials	Constitution and hardening of Portland cement	Bogue, R. H.; Dillon, M. M.; Lerch, W.; Taylor, W. C.
Society of Automotive Engineers, 29 West Thirty-ninth Street, New York, N. Y.	X rays	Quality of scattered radiation	Tucker, K.
E. R. Squibb & Sons, New Brunswick, N. J.	Engineering	Extreme pressure lubricants	Harrington, E. A.; McKee, T. R.
Utilities Research Commission, 72 West Adams Street, Chicago, Ill.	Explosive limits	Properties of gaseous mixtures	Webber, W. W.
	Insulating liquids	{ Preparation of pure hydrocarbons	Astin, A.
		{ Direct current properties of insulating liquids	Gardner, G. W.
		{ Alternating current properties of insulating liquids	Mair, B. J.



Current work of research associates relating to standards of quality, performance, or practice is described under activities and accomplishments.

**Coordination with Other Research Laboratories.**—With the aid of the National Research Council, the American Society for Testing Materials Committee E-9 on correlation of research, the various research laboratories, and many national organizations, every effort is made to coordinate all bureau research work with that done by other bodies to provide the maximum national benefit and to avoid duplication of effort.

Research within the Government service is coordinated by the Chief Coordinator of the Bureau of the Budget.

#### TESTING

Through the testing of standards sent to the bureau by science and industry, research on standards finds its direct application and fruition. The common acceptance of, and conformity to, uniform standards of measurement are essential to the fullest development of the commerce and industry of the nation. The testing service of the bureau provides the means of establishing this uniformity. The bureau acts as a testing agency for the various departments of the Government and in this capacity conducts a great variety of tests to determine whether the item submitted conforms with specifications. Branch testing laboratories are maintained at Northampton, Pa.; Columbus, Ohio; Denver, Colo.; and San Francisco, Calif. Tests of this character are made for the public only in instances where private laboratories are not suitably equipped.

**Commercial Testing Laboratories.**—Because of the large amount of official testing conducted by the bureau it is impracticable to make tests for private individuals if other laboratories can do the work. In Miscellaneous Publication No. 90, entitled "Directory of Commercial Testing and College Research Laboratories," and its supplement, information is given concerning commercial testing laboratories with their branch laboratories or offices.

#### COMMERCIAL STANDARDIZATION

The work of the four divisions of the bureau's commercial standardization group includes the simplification of commodity sizes and dimensions as carried on by the division of simplified practice; the promotion of standard building and plumbing codes, zoning ordinances, etc., by the division of building and housing; promulgation of nationally recognized specifications, and the compilation of lists of willing-to-certify manufacturers of products made in accordance therewith by the division of specifications; and cooperation with industry in establishing as a basis for marketing, definite grades and qualities as commercial standards, by the division of trade standards.

Assistance in the correlation of the specifications produced by the Federal Specifications Board with those produced by commercial agencies is rendered by this group, which has liaison duties with other branches of the Department of Commerce and with other departments on matters in this field.

In formulating the plans and policies for the guidance of the activities of the division of simplified practice, the bureau is aided by a planning committee which meets quarterly at the Department of Commerce. The membership of this committee is as follows:

- E. W. McCullough, manager, department of manufacture, Chamber of Commerce of the United States, Washington, D. C.
- Rear Admiral T. T. Craven, Chief Coordinator, Bureau of the Budget, Washington, D. C.
- G. A. Renard, secretary, National Association of Purchasing Agents, 11 Park Place, New York, N. Y.
- A. W. Shaw, formerly chairman, conservation division of War Industries Board, 8 South Michigan Avenue, Chicago, Ill.
- A. A. Stevenson (chairman), 201 Kent Road, Ardmore, Pa.
- L. P. Alford, The Ronald Press Co., 15 East Twenty-sixth Street, New York, N. Y.
- H. R. Young, secretary, Retailers' National Council, Munsey Building, Washington, D. C.

A description of the procedures followed by the divisions of the commercial standardization group in their cooperative work with producers, distributors, and consumers will be found on pages 180 to 183 of the Standards Yearbook for 1931.

#### ADVISORY COMMITTEES

Where a group interested in the formulation of standards for a given industry, or in the investigation of specific subjects, is not otherwise organized for the purpose, the bureau encourages the formation of an advisory committee. These committees function in the same manner as an informal industrial committee, except that the secretarial work is usually conducted by the bureau. A list of these committees follows:

## Advisory committees

Name	Purpose	Secretary	Membership
Advisory committee on acid in leather.	To advise on technical questions concerning effect of acid on leather.	T. Blackadder, American Leather Chemists' Association and Tanners' Council of America, care of Robert E. Hays, West Washington Square, Philadelphia, Pa.	Manufacturers of leather goods.
Advisory committee on automobile tires.	To advise on technical questions relative to specifications and methods of test.	George Flint, Rubber Manufacturers' Association, 250 West Fifty-seventh Street, New York, N. Y.	Automobile tire manufacturers.
Advisory committee on city planning and zoning.	To encourage proper city planning and zoning by drafting standard State enabling acts, under which municipalities may take action, and through other publications.	Dan H. Wheeler, Bureau of Standards, Washington, D. C.	City planners, engineers, realtors, and housing experts.
Advisory committee on colored sanitary ware.	To standardize colors for sanitary ware.	G. W. Way, Bureau of Standards, Washington, D. C.	All manufacturers of colored sanitary ware.
Advisory committee on cordage.	To advise on technical questions dealing with cordage.	J. S. McDaniel (chairman), 350 Madison Avenue, New York, N. Y.	Cordage Institute.
Advisory committee on cotton.	To advise on technical questions concerning cotton.	R. T. Fisher, 80 Federal Street, Boston, Mass.	Manufacturers of cotton textiles.
Advisory committee on the determination of the composition of petroleum.	For consultation on the technical aspects of the investigation.	J. B. Hill (chairman), Atlantic Refining Co., 3144 Passyunk Avenue, Philadelphia, Pa.	Representatives of oil producers.
Advisory committee on enameled sanitary ware.	To standardize nomenclature, definitions, grading rules, essential dimensions, and types of enameled sanitary ware.	I. J. Fairchild, Bureau of Standards, Washington, D. C.	All manufacturers of enameled sanitary ware.
Advisory committee on fire tests of welded steel floor construction.	To conduct tests to determine fire resistance of welded steel floor construction.	F. H. Frankland, 200 Madison Avenue, New York, N. Y.	Committee of American Institute of Steel Construction.
Advisory committee on hosier.	To advise on technical questions concerning hosier.	Earl Constantine, National Association of Hosiery and Underwear Manufacturers, 334 Fourth Avenue, New York, N. Y.	Hosiery manufacturers.
Advisory committee on hospital rubber supplies.	To advise on technical questions relative to specifications and methods of test.	George Flint, Rubber Manufacturers' Association, 250 West Fifty-seventh Street, New York, N. Y.	Manufacturers of hospital supplies.
Advisory committee on lithographic papers.	To advise on research on standardization of lithographic papers.	R. F. Reed, Lithographic Technical Foundation, University of Cincinnati, Cincinnati, Ohio.	Printers and manufacturers of paper and ink.
Advisory committee on mechanical rubber goods.	To advise on technical questions relative to specifications and test methods.	George Flint, Rubber Manufacturers' Association, 250 West Fifty-seventh Street, New York, N. Y.	Manufacturers of mechanical rubber goods.
Advisory committee on porcelain plumbing fixtures.	To standardize nomenclature, definitions, grading rules, essential dimensions, and types of porcelain plumbing fixtures.	I. J. Fairchild, Bureau of Standards, Washington, D. C.	All manufacturers of porcelain plumbing fixtures.
Advisory committee on preservation of records.	To advise on research on preservation of records.	H. K. Benson, National Research Council, Washington, D. C.	National Research Council; paper makers, merchants, and consumers; Government laboratories.



Advisory committee on rubber floor tile.	To advise on technical questions relative to specifications and methods of test.	George Flint, Rubber Manufacturers' Association, 250 West Fifth-seventh Street, New York, N. Y.	Manufacturers of rubber floor tile.
Advisory committee on standardization of builders' hardware.	To standardize finishes, nomenclature, definitions, types, and general practice affecting builders' hardware.	I. J. Fairchild, Bureau of Standards, Washington, D. C.	All manufacturers of builders' hardware.
Advisory committee on thermochemical research.	To advise on program of investigations.	F. R. Bichowsky (executive secretary) division of physical chemistry, Naval Research Laboratory, Bellevue, Anacostia, D. C.	Representatives of General Chemical Co., Fixed Nitrogen Research Laboratory, and Bureau of Standards.
Advisory committee on thermodynamic properties of petroleum products.	To direct research dealing with the physical properties of petroleum oils.	A. E. Paw, Jr. (chairman), Sun Oil Co., 1608 Walnut Street, Philadelphia, Pa.	American Petroleum Institute.
Advisory committee on underwear.	To advise on technical questions dealing with underwear.	Roy A. Cheney, Associated Knit Underwear Manufacturers, Union Station, Utica, N. Y.	Underwear manufacturers.
Advisory committee on wool.	To advise on technical questions concerning wool.	Walter Humphreys, 80 Federal Street, Boston, Mass.	Wool textile manufacturers.
American Advisory Committee on Electric and Photometric Standards.	To assist in preparation of proposals to International Committee on Weights and Measures.	None. Address, Director, Bureau of Standards, Washington, D. C.	Scientific and commercial associations interested in electrical measurements.
American Society of Mechanical Engineers, special research committee on lubrication.	To study the relation between the properties of lubricants and their performance in service.	A. E. Flowers (chairman), the De Laval Separator Co., Poughkeepsie, N. Y.	American Society of Mechanical Engineers.
American Society of Mechanical Engineers, special research committee on thermal properties of steam.	To direct research on the properties of steam and extension of the steam table.	Alexander Dow (chairman), 2000 Second Street, Detroit, Mich.	
American Society of Mechanical Engineers, special research committee on wire rope.	To direct research on strength of worn wire rope.	W. H. Fulweiler (chairman), 1401 Arch Street, Philadelphia, Pa.	American Society for Testing Materials.
American Society for Testing Materials, Advisory Committee D-13 Textiles.	To advise on A. S. T. M. specifications for textiles.	H. J. Ball (chairman), Lovell Textile Institute, Lowell, Mass.	
Building code committee.	To formulate and recommend provisions for municipal building code regulations.	George N. Thompson, Bureau of Standards, Washington, D. C.	Architects and engineers.
Central research committee.	To advise in general on paper researches.	E. Mahler, Kimberly-Clark Corporation, Nehalem, Wis.	
Certification committee, Horological Institute of America.	Examination and certification of watchmakers.	R. E. Gould, Bureau of Standards, Washington, D. C.	Paper technologists representing manufacturers.
Committee on investigation of insulating liquids.	To advise on program of research on liquid insulators.	J. L. Hecht (chairman), Public Service Co. of Northern Illinois, Chicago, Ill.	Examining board, Horological Institute of America.
Committee on reconditioning, remodeling, and modernizing.	To assist home owners, through educational means, in keeping their property in good condition, and to encourage local modernizing campaigns.	C. L. Christenson, Bureau of Standards, Washington, D. C.	Representatives of electric light and power companies.
Ferrous metals advisory committee.	To guide Bureau in selection of research problems in ferrous metals.	G. B. Waterhouse (chairman), Massachusetts Institute of Technology, Cambridge, Mass.	Architects, editors, and home economists.
			American Society for Testing Materials; Government departments; associations of automotive, mining, and metallurgical engineers; foundrymen; steel manufacturers; American Society for Steel Treating; and National Research Council.

## Advisory committees—Continued

Name	Purpose	Secretary	Membership
Joint committee on Diesel fuel research.	To secure technical data necessary for specification and production of Diesel engine fuels.	W. H. Butler, care of American Society of Mechanical Engineers, 29 West Thirty-ninth Street, New York 1, N. Y.	Society of Automotive Engineers and American Society of Mechanical Engineers.
Joint steering committee on cooperative fuel research.	To assist in formulating program and defining scope of investigations in connection with cooperative fuel research.	C. B. Veal, care of Society of Automotive Engineers (inc.), 29 West Thirty-ninth Street, New York, N. Y.	Society of Automotive Engineers American Petroleum Institute, National Automobile Chamber of Commerce, Aeronautical Chamber of Commerce of America.
Manufacturers' advisory committee on clinical thermometers.	To standardize specifications for clinical thermometers.	E. F. Mueller, Bureau of Standards, Washington, D. C.	All manufacturers of clinical thermometers.
Manufacturers' advisory committee on Fourdrinier wire cloth.	To standardize nomenclature, definitions, kinds, and sizes of wire as a basis for manufacture; physical requirements; and standard practices for the handling, installation, and use of this commodity for paper machines.	G. W. Wray, Bureau of Standards, Washington, D. C.	All manufacturers of Fourdrinier wire cloth.
Manufacturers' advisory committee on vitreous china plumbing fixtures.	To standardize nomenclature, definitions, grading rules, essential dimensions, and types of vitreous china plumbing fixtures.	I. J. Fairchild, Bureau of Standards, Washington, D. C.	All manufacturers of vitreous china plumbing fixtures.
Nonferrous metals advisory committee.	To guide the bureau in selection of research problems in nonferrous metals.	W. H. Bassett (chairman), American Brass Co., Waterbury, Conn., W. M. Corse (secretary), Washington, D. C.	American Society for Testing Materials, Government departments, and associations of electrochemical, chemical, mechanical, mining, and metallurgical engineers, and foundrymen.
Radio advisory committee.....	To assist in formulating and revising program of research in radio communication.	J. H. Dellinger, Bureau of Standards, Washington, D. C.	Associations of radio engineers, broadcasters, radio and electrical manufacturers.
Research committee of American Association of Textile Chemists and Colorists.	To advise on technical questions dealing with the application and testing of dyes.	L. A. Olney (chairman), Lowell Textile Institute, Lowell, Mass.	Textile chemists and colorists.
Research committee of American Dental Association.	To standardize purchase and use of dental materials.	R. H. Volland (chairman), Iowa City, Iowa.....	American Dental Association.
Research committee of American Electroplaters' Society.	To advise on electroplating research.....	Jacob Hay (chairman), 18004 East Park Drive, Cleveland, Ohio.	Foreman electroplaters.
Research committee of International Association of Electrotypers.	To advise on electrotyping problems.....	Harry E. Wise (chairman), Michigan Electrotype and Stereotype Co., 457 Fort Street, West Detroit, Mich.	Employing electrotypers.
Society of Automotive Engineers' research committee.	To assist (through subcommittees) in formulating programs of research on such problems as automobile headlighting, riding qualities of motor vehicles, automotive fuels and lubricants.	C. B. Veal, care of Society of Automotive Engineers (inc.), 29 West Thirty-ninth Street, New York, N. Y.	Society of Automotive Engineers.

Standard State mechanics' lien act committee.	To draft uniform mechanics' lien act for consideration by State legislatures.	Don H. Wheeler, Bureau of Standards, Washington, D. C.	Architects, lawyers, credit men, and associations connected with building or construction operations.
Subcommittee on methods of measuring detonation, cooperative fuel research starting committee.	To develop standard methods of measuring the detonation characteristics of automotive fuels.	C. B. Veal, care of Society of Automotive Engineers (Inc.), 29 West Thirty-ninth Street, New York, N. Y.	Commercial and university research laboratories.
Subcommittee on plumbing, building code committee.	To formulate and recommend provisions for State and municipal regulations of plumbing installations.	George N. Thompson, Bureau of Standards, Washington, D. C.	Sanitary and civil engineers.



## OTHER COOPERATIVE ACTIVITIES

Many national organizations assist the bureau in research, standardization, and simplification projects and, in turn, the bureau cooperates officially with numerous national organizations engaged in similar efforts, frequently designating members of the staff to serve on committees.

## SOME ACTIVITIES AND ACCOMPLISHMENTS

## PRACTICAL APPLICATION

Except for necessary administrative functions, all activities of the bureau are directed toward some phase of standardization, from the pursuit of data to serve as the groundwork or foundation for fundamental standards and master specifications to the final check of delivered material for conformity to specification requirements.

Representative activities and accomplishments are listed alphabetically under titles selected in a practical way for the convenience of the reader without any attempt at systematic classification.

## AERONAUTICS

**Control Surfaces of Airplanes.**—A wind tunnel study of the yawing moments of rudders at large angles of attack was completed with the cooperation of the Aeronautics Branch of the Department of Commerce and the National Advisory Committee for Aeronautics. A bulletin describing the work on ailerons has been published.

**Reduction of Noise in Airplanes.**—In cooperation with the Aeronautics Branch of the Department of Commerce, measurements have been made of the reduction in engine noise effected by various mufflers, some submitted by commercial firms or inventors, the others designed by members of the staff.

**Torsional Strength of Tubing.**—Tubular shafts are commonly used in aircraft to transmit the torques necessary to change the angles of ailerons and other control surfaces in airplanes. The thickness of these tubes must be reduced to a minimum consistent with safety against buckling failure in order to save as much weight as possible.

The present investigation aims to give reliable information upon this subject to the designer. A large number of chrome-molybdenum steel tubes have been tested, and curves have been calculated giving a direct relation between the torque at which buckling begins and the diameter over thickness ratio for this type of tubing. It is planned to extend the work to tubes of aluminum alloy which, together with high strength steel tubes, are widely used in airplane construction.

**Flat Plates under Normal Pressure.**—The bottoms of seaplane floats and of flying boat hulls are usually covered with thin sheet metal supported by a framework inside the hull or float. When the seaplane lands on rough water, the sheet, together with its supporting structure, must transmit impact loads which are frequently sufficient to cause "washboarding" or wrinkling of the sheet. This washboarding makes it harder for the plane to "take off" and is highly undesirable for other reasons. This investigation will give the designer data which would prevent "washboarding" under the

most severe service conditions. It was found that if much thinner duralumin plates were used, the resistance to "washboarding" would be increased. The saving in weight makes possible an increase in the cruising radius or armament of the seaplane.

**Strength of Riveted Joints for Aircraft.**—Thin sheet metal is rapidly replacing wood for the structural members in aircraft. Although welding is widely used for fabricating the joints, there are advantages in riveting some members. To provide fundamental engineering data which would allow designers to obtain the greatest strength with the least weight, an investigation is now being made on the dimensions and method of driving the rivets in thin sheet metal. The specimens will include aluminum and duralumin (aluminum alloy).

As in some places bolts are used instead of rivets, the program will include bolts having different types of threads and other special features for which advantages are claimed by the manufacturers. At present there are probably more laboratory data on the strength of welded joints than on the strength of riveted and bolted joints. This investigation will supply much needed information on the strength of the latter types.

**Crash-Resistant Tanks.**—In cooperation with the Aeronautics Branch of the Department of Commerce, many tests have been made on aircraft fuel tanks designed to be more resistant to failure in accidents. A promising development seems to be a metal tank lined with a flexible material. Some specimens of this construction have made a satisfactory showing in laboratory tests.

**Aircraft Instruments.**—Four electric resistance thermometers for airship use, one bimetallic strip strut thermometer, an experimental accelerometer, one stern weighing-off device for the airship *Akron*, and two suspended head commutator-condenser air-speed indicators were constructed for the Bureau of Aeronautics. In addition, apparatus was developed for testing aircraft oxygen control instruments. The temperature coefficients of the two elastic moduli of most diaphragm and spring materials were measured and a monograph completed on aircraft speed instruments for the National Advisory Committee for Aeronautics.

**Altitude Testing of Aircraft Engines.**—A report is in preparation on the distribution of fuel heat in a 12-cylinder, V-type, water-cooled aircraft engine, supercharged and unsupercharged, for a variety of operating conditions and at various altitudes. The effect of the temperature of the cooling medium on engine performance at altitude, and the effect of engine compression ratio on the variation of horsepower with exhaust pressure are the next problems to be investigated.

**Type Testing of Commercial Airplane Engines.**—At the Arlington engine laboratory, 27 type tests and 4 calibration tests, involving 18 engine types submitted by 11 manufacturers, were undertaken during the past fiscal year for the Aeronautics Branch of the Department of Commerce. Of the 9 engines which successfully passed the 50-hour endurance test, only 4 had not suffered at least one previous failure. Valves were the most common source of major failure, but pistons, crankshafts, and cylinder heads caused two failures each. The revised aircraft engine requirements (effective January 1, 1933)



call for a 50-hour preliminary test by the manufacturer and increase the severity, but not the duration of the present type test.

**Radio-Shielded Ignition Equipment.**—As a basis for preparing Army-Navy specifications on shielded ignition harnesses, tests were conducted jointly at the Naval Aircraft Factory and at this bureau on commercial types of shielded harnesses applicable to radial aircraft engines. The five types tested were found equally satisfactory from the standpoint of radio-interference shielding, but they differed with respect to accessibility, strength, shielding efficiency, and waterproofing. Altitude tests of a Curtiss D-12 engine, with and without a radio-shielded ignition system, showed no significant effect of the shielding on the altitude performance of the engine.

#### AUTOMOTIVE ENGINEERING

**Vapor Lock Investigation.**—Measurements on practically all 1931 models of American automobiles showed that excessive fuel line temperatures occurred in many of them. This may cause boiling of the gasoline and hence engine stoppage due to vapor lock. Modifications in fuel system design have been made in many 1932 cars, resulting in lower fuel temperatures. Vapor lock road tests on these and older models are under way.

**Antiknock Characteristics of Fuels.**—The equipment and procedure for rating motor fuels, developed by the cooperative fuel-research steering committee, has been proposed to the American Society for Testing Materials as a tentative standard. After comprehensive road and laboratory tests, participated in by representatives of the bureau and some 15 automotive and petroleum laboratories, slight changes have been made in the standard test conditions to attain improved correlation between laboratory ratings and knock in automobiles. To insure purity of the primary reference fuels, heptane and octane, samples of each batch are tested by this bureau. Suitable test conditions for determining the detonation characteristics of aviation fuels are being studied.

**Gumming Characteristics of Gasolines.**—A satisfactory test method for determining the gum content of gasolines has been developed. Much information has been obtained on the tendency for the gum content of gasolines to increase during storage, and information is being obtained on the permissible gum content for satisfactory engine operation.

**Testing Motor Fuels and Fuel Dopes.**—The bureau has continued to make engine tests of fuel dopes and special motor fuels for the public as well as for Government agencies in accordance with a revised test method adopted in 1931. No fuel dope has been found to improve power or economy unless it decreased the tendency of the fuel to detonate.

**Measurement of Spark Character.**—In studying the relative effectiveness of ignition sparks, it is important to know their electrical characteristics. Owing to the low inductance and capacitance of the ignition circuit, usual methods of measuring voltage and current with the cathode-ray oscillograph were not found applicable to the spark discharge. It has, therefore, been necessary to develop special methods for this purpose.



**Phenomena of Combustion.**—The effect of inert gases (argon, helium, and nitrogen) on the rate of flame propagation in the explosive reaction between carbon monoxide and oxygen was investigated. The gases in each case were saturated with water vapor. Photographic records reveal the progress of the reactions which were carried out at constant pressure in soap film containers. A similar study is to be made in the presence of smaller quantities of water vapor.

**Combustion in an Engine Cylinder.**—Various cylinder heads equipped with windows of quartz and fluorite have been used in obtaining visual and photographic observations of flame movement and measurements of the cyclic variations in pressure and in infra-red radiation during the explosion period in an engine. Technical reports are in preparation. Preliminary work has been done on the use of ultra-violet absorption spectra to detect molecular changes in the explosive charge ahead of the flame.

**Effect of Air Humidity on Engine Performance.**—As a result of the bureau's work on the variation of engine power with humidity, the National Advisory Committee for Aeronautics has adopted standard dry-air pressures as a basis for correcting sea-level and altitude tests of aircraft engines, and a similar revision of the Society of Automotive Engineers' power-correction formula has been proposed. Recent tests at compression ratios from 4:1 to 10:1 show no significant change in specific fuel consumption with increasing humidity.

**Automobile Brakes and Brake Testing.**—With the assistance of the American Automobile Association, the bureau is collecting statistical data on brake performance from different sections of the country as a basis for revising the safety code for brakes and brake testing adopted in 1927 as an American tentative standard.

**Automobile Headlighting.**—A motion-picture camera, mounted on an automobile, was so equipped as to show graphically the effect of curves, grades, and road irregularities on the field of view under night-driving conditions. These pictures effectively illustrate some important facts about safe headlighting determined at the bureau, but not generally understood.

**Motor-Vehicle Specifications.**—Further assistance has been given various Government agencies in the preparation of improved purchase specifications for special types of automotive equipment, such as ambulances and mail-truck chassis. Many vehicles and accessories are now procured on the basis of performance tests by the bureau.

#### BUILDING AND HOUSING AND BUILDING CONSTRUCTION

**Building Codes.**—Nearly 300 cities reported that they were using the recommended minimum requirements of the Department of Commerce building code committee. The bureau has assisted numerous local and State code committees and building officials. Substantial progress was made in several fields, such as in requirements for building exits and precautions to be followed during erection of buildings. Revised rules were prepared for small dwellings to afford home owners the maximum use of latest developments consistent with safety.

**Plumbing Codes.**—The bureau has continued its study of the performance of plumbing systems with particular reference to possible reductions in required pipe sizes.

**Cooperation with Other Agencies on Building and Housing Problems.**—The President's Conference on Home Building and Home Ownership which was held in Washington in December, 1931, afforded an unusual opportunity for advancement of projects by the bureau in cooperation with representatives of leading groups from all sections of the country. The committees especially concerned included those on fundamental equipment (heating, plumbing, lighting, refrigeration, etc.); utilities for houses; subdivision layout; business and housing; industrial decentralization and housing; blighted areas and slums; reconditioning, remodeling, and modernizing; construction, city planning, and zoning; finance, home ownership, and leasing; home information centers; relationship of income and the home; legislation and administration; and technological developments. These subjects were taken up with special reference to low-cost housing for families of small income, through reduced costs and improved methods and quality in construction materials and equipment.

Joint studies, made with committees of the National Conference on Construction, aim to help stabilize construction activity and enable the industry better to serve the public.

**City Planning and Zoning.**—The bureau has continued to issue its periodic reports on city planning and zoning developments in all parts of the country, and is also pursuing its study of local subdivision regulations.

**Home Financing.**—Extended investigations of the home financing situation were made for the President's conference, and for the congressional committees which considered the Federal home loan bank bill.

**Reinforcing Bars for Concrete.**—There is no general agreement on the method which should be used to determine the cross-sectional area of deformed bars when samples are tested for yield point and ultimate strength. An investigation was made using the four methods which have been widely used in this country. The results showed definitely that if the area is computed from the length and weight of the bar more consistent results are obtained at less cost than if any of the other methods are used. The publication of this paper will, undoubtedly, lead to the general use of this method and benefit the manufacturers and users of deformed reinforcing bars.

**Steel Columns Encased in Brickwork.**—At the request of the municipal architect, District of Columbia, 6-inch rolled steel columns, 22½ feet long, were tested in compression, some encased in brick walls and some bare.

The columns encased in brickwork did not buckle sidewise as did the bare columns, but were much stronger, behaving like very short bare columns. The results of these tests are now being applied in the design of some district buildings and will effect a saving in the cost.

**Formed Sheet Steel Floor.**—In cooperation with the American Institute of Steel Construction an investigation has been made of the strength and other properties of a floor made from two sheets of



steel which are bent and then fastened together by electric spot welds to form a panel having longitudinal cells. The tests showed that these panels were light and strong. Their use will, in all probability, have a profound effect upon methods of construction and upon building costs. This floor may be expected to stimulate the development of radically new materials and methods of fabrication for small houses as well as apartment houses and office buildings.

**Properties of Floor Coverings.**—The Asphalt and Mastic Tile Association has established a research associateship at the bureau to study the properties of various asphalt floor tiles in order to set up standard specification requirements for the guidance of manufacturers. The work is well under way and satisfactory progress is being made in measuring wear resistance, hardness, and other important properties.

**Soundproof Partitions.**—During the past year 13 panels of various constructions, submitted by different manufacturers, were measured for sound transmission. In addition, considerable attention was given to the development of improved methods and instruments for this work. The public demand for soundproof walls and floors in apartment and 2-family houses is steadily increasing.

**Absorption Coefficients of Acoustic Materials.**—During the past year sound-absorption measurements have been made on 97 different samples of material submitted by manufacturers.

It is worthy of note that this work represents the development of a new business in the country, and that fully three-quarters of this development has taken place in the last three years. In this the bureau has played an increasingly important part. The materials are used in the interior finish of auditoriums to produce good acoustic qualities.

#### CEMENT AND CONCRETE

**Temperature Studies of Cements During Setting.**—Studies have been made on three samples of Portland cement clinker to which 50 different retarders had been added in varying percentages. Studies have been made also of the temperature rise in the setting of concrete made into 6 by 12 inch cylinders. The strengths of these cylinders are being compared with the strengths of those made and stored under normal conditions.

**Tests of Arlington Memorial Bridge.**—The effect of shrinkage and time yield on the crown deflection of the arch during the period from the 18th day to the 24th month after the construction of the two inner arch barrel strips was equivalent to a temperature drop of 27° F. Similarly, the effect of these factors after the superstructure was completed and during the period from the 15th to the 27th month was equivalent to a temperature drop of 7° F.

**Reaction of Calcium Chloride on Cement.**—An investigation has recently been undertaken of the effect of calcium chloride upon the physical properties of cement, and a detailed physicochemical study of the reactions between the calcium chloride and the separate cement constituents is in progress.

**Constitution and Hardening of Portland Cement.**—The Portland Cement Association fellowship has continued to devote its full time



to a study of the basic chemical problems of the cement industry to the end of improving the general usefulness and durability of concrete structures. One paper has been published on the compounds formed by soda in a part of the chemical system of Portland cement. Work is under way on the influence of composition on the qualities of the resulting cements, especial attention being given to a study of the heat liberated during hardening and the volume changes of specimens stored under various conditions of exposure.

**Masonry Cements.**—Studies are now largely completed of 40 brands of masonry cements now on the market. Workability, water-retaining capacity, volume change in the wet and dry condition, compressive strength, transverse strength and modulus of elasticity, rate of water absorption, and resistance to freezing and thawing have been determined. Compressive strengths from 10 to 3,000 pounds per square inch have been obtained at the end of seven days. The resistance to freezing and thawing varied from failure in two cycles to no signs of failure in 30 cycles.

**Volume Changes of Mortars During and Subsequent to Setting.**—Length measurements have been made on a number of mortar specimens made at 21° C., the temperature being uniformly increased for 10 hours, at which time it was 60° C. The specimens were all found to increase in length during this time, the increase ranging from 0.008 to 0.015 per cent. Similar specimens maintained at 21° C. showed an increase in length from 0.010 to 0.017 per cent. Measurements made at the end of one year showed that there had been practically no change in length. These studies are of particular interest in the construction of large dams.

**Cast Stone.**—Based upon the results of tests completed during the year, Federal specification SS-S-721 for architectural cast stone has been issued. A minimum compressive strength of 5,000 pounds per square inch and several absorption requirements have been incorporated in the specification.

**Waterproofing Compounds.**—A report on tests of integral and surface waterproofing compounds for concrete, by C. H. Jumper, has been published in the Bureau of Standards Journal of Research, vol. 7 (RP394), p. 1147, 1931.

**Cement Reference Laboratory.**—The Cement Reference Laboratory, a cooperative project of the Bureau of Standards and the American Society for Testing Materials, devoted the greater part of its activities to field work, inspecting 175 cement laboratories, thus completing a second tour involving 268 inspections. The effectiveness of the work is becoming evident in the continued improvement observed in apparatus and methods. That the work is considered valuable is indicated by the increased use of the service by laboratories and other interested parties. The Bureau of Public Roads now requires periodic reference laboratory inspection at all laboratories which make acceptance tests of cement for Federal-aid projects. During the year, in addition to 65 inspections for State highway departments, 16 inspections were made for commercial laboratories which desired to comply with this ruling of Public Roads.

## CHEMICAL ANALYSIS

**Hydrocarbons from Petroleum.**—With the cooperation and financial support of the American Petroleum Institute, this investigation has been continued during the year, and the following new hydrocarbons have been isolated from petroleum: 2-methylhexane, *p*-xylene, *o*-xylene, *m*-xylene, ethylbenzene, 2-methylheptane, and *n*-decane.

**Insoluble Matter in Shellac.**—The bureau has developed a new method for determining the insoluble matter in shellac. This method uses butanol or ethylene glycol-monoethyl ether (cellosolve). It appears to be accurate and easy of execution.

**Volume Change at an Electrode During Electrolysis.**—An electrode pycnometer suitable for determining volume changes at the electrode during electrochemical reactions has been developed and applied to certain electrodes where this quantity is required in the determination of transference numbers by the moving boundary method.

**Platinum Metals.**—An accurate method for the analytical separation of rhodium and iridium, together with suitable methods for the determination of the two metals was completed. A beginning has been made on a complete procedure for the analysis of materials containing all of the platinum metals. Spectrographically pure iridium and rhodium were prepared for use in the bureau's work on primary standards of light.

**Decomposition of Cyanide Plating Baths.**—The factors that affect the decomposition of cyanide solutions were studied, and methods of reducing the decomposition have been suggested.

**Methods of Analyses.**—New or improved methods have been developed for the determination of tin in ferrous materials, cobalt in irons and steels, silicon in ferrous materials, and molybdenum in ores and metallurgical materials.

**Analytical Methods.**—Improvements in hydrogen ion, contact potential, and indicator methods which the bureau has published have an important bearing in studies of the effect of acidity on the permanence of farm waste products such as wall boards, paper, and other fibrous materials.

**Analytical Reagent Chemicals.**—The critical study of methods for the determination of various impurities in reagent chemicals has been continued in cooperation with the American Chemical Society. This resulted in the publication of 17 new specifications during the year. These specifications, of which 121 now exist, are recognized by all American producers of reagents.

**Distribution and Preparation of Standard Samples.**—Five thousand two hundred and fifteen samples of 96 standards were distributed, having a sales value of \$11,696. Samples were furnished free of charge to Government departments, States, and State universities and colleges. New standards prepared during the year are: Chromium-nickel (18-8) steel; nitriding (chromium-molybdenum-aluminum) steel; low carbon-high sulphur steel; silica brick; and dead burnt magnesite.



## CLAY AND SILICATE PRODUCTS

**Factors Affecting the Crazing of Earthenware.**—The data indicate that the ingredients of earthenware bodies most susceptible to moisture expansion are fused feldspar, crystalline feldspar, and clay. The water absorption of some experimental bodies was reduced by progressively higher heating, and the content of fused feldspar increased; of this series, bodies heated to cone 6 to 8, and having a water absorption of about 10 per cent, showed the greatest moisture expansion.

**Special Low-Fire Whiteware Bodies.**—Ceramic bodies comparable in transverse breaking strength to earthenware, nearly white in color and varying in absorption from 1 to 5 per cent, were made by the dry press process of commercially available materials and matured below 1,000° C. The bodies will resist mechanical abrasion to a very satisfactory degree. Glazed specimens resisted crazing satisfactorily in laboratory tests. The final report is scheduled to appear in an early issue of the Bureau of Standards Journal of Research.

**Ceramic Materials of Low Thermal Expansion.**—Some silicates of several elements in Group II of the periodic system were investigated, and cordierite, zinc orthosilicate, celsian, and beryl were found to have surprisingly low thermal expansions. A body approaching the first in composition is being developed commercially.

**Study of Refractories.**—The transverse strength and modulus of elasticity in flexure obtained at 1,250° C. of 17 different brands of fire-clay brick was increased from 100 to 400 per cent by first reheating the brick for five hours at 1,400° C. The plastic deflection under load, on the other hand, decreased from 50 to 100 per cent under these conditions.

Samples of five kaolins, representing some of the important world sources, were fired at eight different temperatures ranging from 1,100° C. to approximately 1,650° C. The chemical analyses and pyrometric cone equivalents were obtained on the raw materials, the thermal expansion, porosity, and specific gravity on the fired materials, and the petrographic analyses on both the raw and fired. X-ray diffraction patterns were made of Georgia, North Carolina, and Mexican (dickite) kaolins, mullite, and cristobalite.

**Thermal Dilatation of Fire-Clay and Special Refractories from 20° to 1,800° C.**—Linear expansion measurements were obtained of 18 different materials which had received from one to four heat treatments at temperatures ranging up to 1,800° C. Observations were made to 1,800° C. if the refractoriness of the material permitted. Among the materials were Pennsylvania flint fire clay; New Jersey siliceous clay; Georgia kaolin; English china clay; Tennessee, Kentucky, and English ball clays; Missouri and New Jersey fire-clay bricks; Indian, Turkish, Cuban, and African chrome ores; high alumina brick; Austrian magnesite; and an insulating brick. All of the materials were tested to 1,000° C. in both an oxidizing and a reducing atmosphere. No noticeable differences in expansion were noted except in the case of the chrome ores, which showed an exceptionally high expansion between 700° and 1,000° C. under reducing conditions.



**Problems Relating to Saggings.**—It was established that the life of the saggings, if estimated by their resistance to thermal shock, could be predicted when such properties as modulus of elasticity, transverse strength, and thermal expansion of the clays used are known. The modulus of elasticity in flexure determined at 100° C. intervals between room temperature and 700° C. gave the following information: (1) Specimens containing 80 per cent alumina showed no change; (2) all other materials showed a gradually increasing modulus of elasticity with increase of temperature, however, those containing a high percentage of silica (cristobalite) showed a decrease at 100° C. when compared with the values obtained at room temperature; and (3) the percentage increase in modulus of elasticity at the several temperatures was not the same for the various sagger bodies.

**Survey of the Properties of Common Brick.**—The compressive and transverse strengths, water absorptions, size, weight, color, and tendency to effloresce were determined on 683 grades of bricks from 228 plants in 36 different States.

**Brick Masonry Materials.**—Investigations of the physical properties of mortars and bricks and of the durability of the bond of mortar to brick have been continued.

**Reinforced Brick Masonry.**—Results of shear tests of beams indicate that resistance to failure by diagonal tension depends largely on the arrangement of the bricks and the tensile and shearing bond strengths of mortar to bricks.

**Resistance of Certain Materials to the Abrasive Action of Plastic Clay.**—Tests were continued on dies made from the 19 metals and alloys using the "standard" abrasive mixture of 60 clay and 40 glass sand. In the equation  $CY^n = X$ , in which  $C$  is a constant,  $X$  the extrusion pressure, and  $Y$  the abrasion loss, it has been found that  $n$  is a constant, the value of which is 0.645 for the standard abrasive.

Tests were also made using a plastic porcelain composition as the abrasive material in comparison with the "standard." The value of  $n$  was found to be 1.16 as constant for that particular abrasive material.

Abrasion tests of dies made from sillimanite porcelain gave a high abrasive resistance at first, the resistance decreasing with depth. The wear resistance or service  $Z$  when plotted against wear depth  $W$  is expressed by the equation  $(Z - A)(W + B) = K$ , in which  $A$ ,  $B$ , and  $K$  are constants.

**Extrusion Machine Investigation.**—The study of the auger extrusion machine for molding hollow tile has given data indicating how type of auger tip, length of collective spacer, and length and taper of both die and cores affect its performance. A variation in any one of these factors has its individual effect, but may differ when coupled with a change in one or more other factors. Design of the auger and taper of the die influence both rate of extrusion and power consumption. Length of collective spacer affects power consumption at all times and the rate of extrusion within certain limits, while length of die, within practicable limits, influences only the power requirements.

**Columbus Laboratory.**—In determining the nature of the glassy bond formed in fired ceramic materials, using five eutectic glasses

as a basis for blends, a total of about 80 glasses was made up. Data were then obtained on the properties of tensile strength, elasticity, fusing temperatures, etc. The next step is to observe the effect which additions of impurities, such as iron, mica, etc., will have on such glasses. A number of these glasses containing mica have been made up and some data collected. Five and ten per cent additions of mica are found to be readily absorbed.

One of the major investigations has been a comparative study of the properties of English and American china clays with a view to making substitutions easy for the manufacturer. The study of the English clays has been completed and the final report is in process of preparation. Representative china clays from the heavy producing areas in the United States have been obtained and a large amount of data collected during the year. This has included strength, shrinkage, porosity, base exchange, and other determinations on the clays in unfired and fired state. The future program calls for a study of the properties of these clays when combined with other potter's materials in bodies, as was the case with the English clays. This work is well under way, nearly all of the clays having been made up into bodies composed of 50 per cent clay and 50 per cent potter's flint.

The work on the properties of 27 Ohio clays used in heavy clay manufacture has been completed, and a final report is being prepared. A portion of the data is being turned over to the Ohio geological survey for publication in one of its clay surveys.

In cooperation with the special boiler refractories committee of the American Society of Mechanical Engineers, the fundamental study of the multiple component system ( $\text{SiO}_2$ ,  $\text{CaO}$ ,  $\text{Al}_2\text{O}_3$ ,  $\text{FeO}$ , and  $\text{Fe}_2\text{O}_3$ ) involved in the interaction of the clay refractories with the slags has been carried forward and about 60 new points were determined during the year. In addition, considerable work was done in determining the effects of certain coal ashes on brands of fire brick in accordance with the test worked out and reported the previous year. Continued work along this line seems to confirm previous findings.

#### COLORIMETRY AND PHOTOMETRY

**Calibration of Lovibond Glasses.**—These are color standards—the complete set numbering upward of 400 different colors—originally designed for grading the color of beers, but now extensively used by such agencies as the vegetable oil industry as a basis for the fulfillment of contract. Their extended use in this country constrained the bureau to undertake an extensive investigation of their colorimetric accuracy individually and in combination. It has further led to steps being taken to bring about international standardization of these glasses. The statistical investigation of the uniformity of the red glasses, begun in 1928, has been continued; a new fundamental standardization of the red, yellow, and blue series has been undertaken and some progress made.

**Standard Glass Filters.**—These are intended for checking spectrophotometric transmission as determined by various instruments and different laboratories. Filters of five different kinds of glasses have



been selected and extensive measurements of the spectral transmission of four kinds have been made. In accordance with a plan agreed upon by representatives of the national laboratories of Great Britain, Germany, and the United States, one set of these glasses, measured with great care, is to be sent in turn to the National Physical Laboratory of Great Britain and to the Reichsanstalt of Germany to serve in an international comparison of measurements of spectral transmission.

**Color Grading of Illuminants.**—The color of illuminants is expressed by their "color temperature"; that is, by the temperature of a closed cavity which most nearly matches the illuminant in question. Preliminary work has been done toward using the radiation from freezing iridium and other metals as standards of color temperature. The radiation from iridium has proved a reliable means of comparing the candlepower of lamps differing markedly in color, and has shown the consistency of the existing light standards of the bureau.

**Waidner-Burgess Standard of Light.**—This standard, reported last year, has been again set up at the bureau and is also being given a thorough test in three foreign countries. The results obtained at this bureau agreed with those previously reported to approximately 0.1 per cent. The international adoption of this standard may be expected at the next International Conference on Weights and Measures in 1933.

**Radiation at Temperature of Molten Iridium.**—The brightness of a "black body" immersed in freezing iridium was determined in terms of the existing light standards of the bureau. The value 1,243 candles per square centimeter, so obtained, agrees very well with the value derived from the Waidner-Burgess standard and the freezing points of platinum and iridium.

**Maintenance of the International Candle.**—International measurements on 10 carbon-filament lamps supplied by the bureau have shown that the units of luminous intensity as maintained in France, Great Britain, and the United States are in close agreement, but the international candle, when computed from the Hefner unit as maintained in Germany, is smaller by more than 1 per cent than the unit maintained in the other laboratories. This difference is in the basic unit; still larger discrepancies arise in measurements on lamps of commercial types because of difference in color of the light. The national laboratories of the four countries mentioned have agreed to bring their standards of light into accord through the use of the factors for visibility of light established by measurements at the bureau some years ago and since accepted by the International Commission on Illumination. Colored filters to serve this purpose are being circulated for final measurement at the four laboratories.

#### COMMERCIAL STANDARDS

**Progress During the Year.**—Fourteen preliminary conferences and nine general conferences with the industries concerned were held in order to pave the way for the establishment of standards of quality for binders' board, wool and part-wool blankets, oil storage tanks, sulphonated oils, fiber insulating board, hosiery lengths,



men's shirts (exclusive of work shirts), surgeons' rubber gloves, apple wraps, cast stone, and pure dye rayon fabrics.

Cooperation with the respective industries, on their request, resulted in the acceptance and promulgation of 10 commercial standards for the following commodities: Fourdrinier wire cloth; plywood (hardwood and eastern red cedar); bag, case, and strap leather; steel bone plates and screws; hospital rubber sheeting; wool and part-wool blankets; diamond core drill fittings (second edition); surgeons' latex gloves, surgeons' rubber gloves; and clinical thermometers (second edition).

Eleven commercial standards were issued in printed form.

Surveys of adherence are made periodically. The table shows results of such surveys during the fiscal year.

*Adherence to commercial standards*

Item	Period covered by survey	Number of manufacturers reporting	Unweighted adherence
			<i>Per cent</i>
Blouses, shirts and junior shirts, and waists (button-on); boys', CS14-31.	6 months ending Dec. 31, 1931.....	20	70
Feldspar, CS23-30.....	6 months ending Sept. 30, 1931.....	12	51
Gage blanks; plug and ring, plain and thread, CS8-30.	Year ending July 31 1931.....	15	72.9
Hardware, builders (nontemplate), CS22-30....	6 months ending Dec. 31, 1931.....	26	73
Joints, ground glass, interchangeable, CS21-30....	6 months ending June 30, 1931.....	6	76
Linings, aromatic red cedar closet, CS26-30....	do.....	9	83
Mirrors, plate glass, CS27-30.....	6 months ending Sept. 30, 1931.....	77	73
Mopsticks, CS2-30.....	do.....	10	92
Nipples, pipe, brass, CS10-29.....	Year ending July 31, 1931.....	19	99.7
Oils, fuel, domestic, and industrial, CS12-29....	6 months ending June 30, 1931.....	43	76
Pajamas, men's, CS15-29.....	6 months ending Dec. 31, 1931.....	19	66
Patterns, dress, CS13-30.....	6 months ending Sept. 30, 1931.....	13	100
Patterns, foundry, wood, CS19-30.....	Year ending Apr. 30, 1931.....	393	65
Plumbing fixtures, porcelain (all-clay), staple, CS4-29.	Year ending June 30, 1931.....	6	95.8
Plumbing fixtures, vitreous china, staple, CS20-30.	do.....	19	85.8
Shafts, golf, hickory, CS18-29.....	Year ending Dec. 31, 1930.....	9	53.9
Thermometers, clinical, CS1-28.....	Year ending June 30, 1931.....	26	79
Unions, malleable iron or steel, screwed, standard weight, CS7-29.	do.....	14	70
Wall paper, CS16-29.....	do.....	28	59.8

DENTAL MATERIALS AND METHODS

**Improvement in Dental Materials.**—Specifications are now available for alloys, investments, wax, and impression compound. The improvements in some of these materials, noted recently, are as much as 50 per cent. These improved supplies are available at no extra cost; in fact, in some instances, prices have been reduced.

The savings to the public through the use of safe dental materials exceed by many times the cost of the research.

ELECTRICAL UNITS AND MEASUREMENTS

**Maintenance of International Electrical Units.**—For the fourth consecutive year comparisons of electrical units were made by taking standard cells and resistance coils to the principal European standardizing laboratories. By using the new type of resistance standards developed at the bureau a considerably higher precision has been

obtained in comparisons of the ohm than was previously possible. The results obtained show that the ohms of Great Britain and of Germany now differ by less than 2 parts in 100,000, while the ohm of the United States is between the two. However, the unit used in France is larger than that of the United States by 7 parts in 100,000.

Known discrepancies in the values for the second basic unit, the volt, led to a special joint test of the national standards by means of the silver voltameters. This work was done at the German national laboratory, the Physikalisch-Technische Reichsanstalt, by representatives of the Reichsanstalt, the British National Physical Laboratory, and the bureau. It showed that the German value for standard cells was in error. Correction of that error has brought the units of the three laboratories into agreement within 3 parts in 100,000, the volt of the bureau having the lowest value of the three. The French unit is smaller still by 3 parts in 100,000.

**New Basis for Electrical Units.**—The plan to replace the present international electrical units (which are represented by arbitrary standards) by others only slightly different, but concordant with mechanical units, requires most precise determinations of the new units. Such determinations have been in progress at several national laboratories for a number of years. The bureau is establishing a value for the ohm by two methods, both of which involve the construction of inductance coils having dimensions which are very accurately measured; it is establishing the ampere by weighing the forces between coils carrying electric current. The work of the last year has been largely a study of the many small corrections necessary in order to assure the highest attainable accuracy in the final results.

Corrections made during the past year to results previously obtained with the Rosa-Dorsey-Miller current balance indicate that the international ampere equals 0.99996 absolute ampere. Measurements have also been made with a new combination of fixed and moving coils, but computations have not yet been completed. The value for the ohm reported last year must be corrected because the steel length-standards used to measure the inductance coil had shrunk slightly since calibration. The corrected value (derived from a coil on porcelain) is 1 international ohm equals 1.000463 absolute ohms. An independent determination with a coil wound on quartz has given 1.000458, but corrections for variations in pitch of the windings are yet to be made.

**Measurement of High Voltages and Large Currents.**—A number of mechanical improvements have been made in the high-voltage electrometer to increase its accuracy beyond the present limit of 0.1 per cent. The standard voltage transformers have been rechecked at several temperatures and show less than 0.01 per cent change for 10° C.

The standard current transformer has been rebuilt and is available up to 10,000 amperes at 60 cycles. Motor-generator equipment limits measurements at 25 cycles to 8,000 amperes.

**Development of Electrical Instruments.**—The bureau has designed some electrical instruments for special needs. These include a composite-coil ammeter for accurate alternating-current measurements, a potentiometer for measuring temperature differences up to



5° C. and giving a perceptible indication on its lowest range for 0.0001°, and a potentiometer for comparing the electromotive forces of standard cells with an accuracy of a few parts in 10,000,000. Convenient procedures for the design of self-inductance standards were developed.

**Magnetic Testing and Research.**—The results of two investigations, one on testing with high magnetizing forces and one on testing at very low inductions with alternating currents, were utilized in a revision of the specifications of the American Society for Testing Materials for standard methods of magnetic testing. The results of an investigation, recently completed, on the effect of mechanical strain on magnetic properties, will aid materially in the interpretation of the results of magnetic tests made for the purpose of determining the fitness of steel products for specific purposes. In an investigation of the characteristics of heat-treated steel wire, conclusive evidence as to aging effects was obtained by thermomagnetic analysis.

**Dry Batteries.**—Periodic "qualification" tests of dry batteries from principal manufacturers have been made, using the bureau's automatic testing equipment. The results served Government purchasing officers, and also as a basis for Federal Specification W-B-101, recently completed. Tests for industrial flashlight batteries have been developed.

**Storage Batteries.**—Specifications for storage-battery electrolyte are in preparation. The resistance of wood and porous-rubber separators was compared by improved methods, and the resistivity of sulphuric acid determined for service conditions at low temperatures. Corrosion of plates and detrimental effect of antimony were found closely related. New alloys were tried in battery construction, and nonspill devices for airplane batteries and pressures within cells were studied.

#### FIRE RESISTANCE

**Federal Fire Council.**—A report was submitted on the fire hazard survey of the portion of the Capitol group of buildings requested by a Senate resolution, and on water-meter installations in lines serving Government buildings in the District of Columbia, the latter with particular relation to restriction of water flow for fire extinguishment. The inspection of Federal civil prisons, conducted under the auspices of this group by the National Fire Protection Association, was completed, reports being submitted on eight institutions. A form for use in inspecting properties for fire hazard and one for reporting of fires were developed and distributed to Government departments and establishments.

**Fire Tests of Welded Steel Floors.**—This new construction, a furnace for the testing of which was constructed last year, consists of a steel floor plate welded to beams spaced 2 feet apart. To determine the resistance against fire from above, six fire tests were conducted by burning out discarded furniture and records in amounts from 10 to 40 pounds per square foot of floor area, the floor plate being unprotected or protected with cement or gypsum mastic and aerated or dense cement concrete. Five fire endurance tests and one fire and hose stream test were conducted with fire exposure on the



protected construction from a gas-fired furnace below the floor. It was found that a fire above the floor has less effect on the construction than one of equivalent severity applied from below. The floors showed ability to support working load in both series of tests even after large deflections had occurred.

**Fire Protection of Records.**—Papers or reports were published on fire exposure conditions for safes and vaults as affected by the construction, occupancy, and height of buildings, and on general methods of record classification, determination of useful life, protection of those having value, and destruction of those no longer useful. Revision of Federal specifications for insulated safes was completed and three safes were tested to determine conformity with specification requirements. A survey made of the property of bureaus of the Department of Commerce showed that, for a total value of buildings and contents of near \$225,000,000, over 80 per cent consists of records and similar uninventoried values.

#### FRICITION AND LUBRICATION

**Journal Bearing Performance.**—An investigation has been made of the performance characteristics of journal bearings in the region of thin film lubrication. Measurements of friction were made with high-tin Babbitt metal and high-lead bronze bearings operated over wide ranges of speed and load with several mineral oils. A general correlation of the results was found to be possible, which throws new light on the problem of journal bearing design and performance.

**Thin Film Lubrication.**—Using self-aligning steel rolls sliding on a rotating flat plate, friction measurements have been made over a speed range from 0.005 to 500 revolutions per minute at various pressures up to 15,000 pounds per square inch and with oils of widely different viscosities. These results indicate for the first time a satisfactory method of approach in investigating the oiliness characteristics of oils. Other oils, metal combinations, and machines are now being investigated.

#### GAS ANALYSIS AND SERVICE

**Cooperative Orifice Meter Tests.**—The survey of the present status of measuring pulsating gas flows was completed and a report presented. As a result of this report the American Gas Association at its annual meeting allotted funds for some laboratory tests on this problem to be conducted at the Bureau of Standards. This work has been postponed to accommodate other cooperative work on the general problem, deemed to be of more immediate importance.

A joint committee on orifice coefficients was formed by the American Gas Association and the American Society of Mechanical Engineers during the year. Three of its members, including the bureau member, are collaborating in collating the data in the hands of the two committees; certain additional tests are being carried on to aid in correlating these data.

**Gas Analysis.**—The bureau's work on methods of gas analysis included: The rapid separation of gases by fractional distillation;

further improvements of gas analysis apparatus for general laboratory use; the separation of "illuminants" from each other; determination of the extent to which the oxidation of nitrogen, mercury, and iridium affect analyses by combustion; the removal of vapors of reagents from gases under analysis; and a study of the interference by sulphur dioxide in analyses made by the use of iodine pentoxide.

Assistance was given to nine manufacturers of laboratory apparatus who undertook commercial production of apparatus for gas analysis of types previously developed by the bureau.

**Elimination of Hazards in the Use of Gas.**—The bureau has cooperated in the formulation of standards for gas with the American Standards Association, the American Gas Association, the National Fire Protection Association, the District of Columbia, and the President's Conference on Building and Housing, and has conducted laboratory work in cooperation with the Washington Gas Light Co. for the purpose of eliminating hazard from carbon monoxide poisoning in certain situations.

**Design of Gas Appliances in Relation to Service Conditions.**—An extensive experimental investigation was made of the factors which determine the best design for an appliance to use natural gas. The study included the effect of variable conditions of service and adjustment in relation to design, which is essential to consideration of standards of service rendered by a public utility supplying fuel gas.

**Standards for Gas Service.**—Standards of service, voluntarily maintained by 370 of the largest gas companies, were compared and tabulated. A completely revised set of rules was prepared for recommendation to State regulatory bodies and, with modifications, to municipalities. Two States and two municipalities were assisted in the formulation of standards of service, and conferences on the same subject held in Washington with official representatives of six States.

#### GLASS AND VITREOUS ENAMELS

**Production of Optical Glass.**—Thirty-two pots of optical glass, embracing five different kinds, were melted. From a part of these melts 36,787 blanks for optical elements, weighing 3,627 pounds, were made for the Navy Department. It has now been demonstrated that the time required for melting borosilicate crown glass can be reduced about 45 per cent, or from 24 to 13 hours.

**Composition and Physical Properties of Glass.**—It has been shown, in the bureau's studies of the soda-lime-silica glasses, that the relations between their refractivities ( $N-1$ ) and specific volumes ( $V$ ) for certain wave lengths ( $A$ ) in the visible spectrum can be expressed by  $N-1=x-yV+z$  (per cent CaO) in which  $x$ ,  $y$ , and  $z$  have the following values for the indicated wave lengths:

Spectral line	Wave lengths $A$	$x$	$y$	$z$
C-----	6,563	0.8570	0.8814	0.001181
D-----	5,893	.8660	.8970	.001157
F-----	4,861	.8878	.9345	.001099
G-----	4,358	.9045	.9632	.001055



Similar tentative relations have been developed for glasses containing potash and magnesia.

The tensile strength of six glasses (annealed) was determined, using rods 1.5 mm in diameter. Borosilicate, medium flint, barium flint, and dense flint glasses have approximately the same maximum tensile strength, namely, 11 kg/mm<sup>2</sup>, and the strength of light barium crown and light crown (ordinary plate) glass is approximately 15 kg/mm<sup>2</sup>.

The thermal expansion of a number of soda-lime-silica glasses has been determined from room temperature to the initial softening point, and equations have been derived from which it is possible to compute the expansion of any glass in the range of compositions studied. One of the equations is as follows:  $E = 14 + 2.5B + 2.37C - 0.02(B + C)^2$ , in which  $E$  is the total expansion up to the softening point and  $B$  and  $C$  are the percentages of soda and lime, respectively.

**Thermal Expansivity and Elasticity of Typical First Coat Vitreous Enamels.**—The thermal expansivity of enamels at higher temperatures is important. Its chief effect is seen in the contraction during cooling, after the manufactured article has been fired in a furnace at red heat. The values for expansivity, as determined at temperatures up to 100° C., agreed in general with those calculated from the accepted factors, which are based upon 100° C. The determined values increased with temperature, however, and at 400° C. exceeded the calculated values by one-fifth. Experiments showed that substituting sodium oxide for boric oxide, and feldspar for flint, is a less effective means of increasing the expansivity than is indicated by the accepted factors.

Young's modulus of elasticity was affected but little by variations in composition within commercial limits, and the average value was about 8,200 kg/mm<sup>2</sup>.

#### HEAT AND TEMPERATURE MEASUREMENTS

**Thermal Properties of Water and Steam.**—This work has been continued with the cooperation and support of the American Society of Mechanical Engineers' special research committee on thermal properties of steam. A calorimeter designed for measurements at high temperatures and pressures was completed and used in measurements of heat capacity, latent heat of vaporization, and vapor pressure. The vapor pressure measurements covered the range from 100° to 370° C., and in this range it appears that the relation between temperature and vapor pressure is now reliably known within a few parts in 10,000 of the pressure.

**Specific Heats at Low Temperatures.**—Measurements of the specific heats of certain nitrogen compounds at low temperatures may be used to determine the possibility of synthesizing these compounds. Measurements of this kind have been made on a number of compounds for the Fixed Nitrogen Laboratory in connection with its program for the synthesis of such compounds for use as fertilizers.

Similar measurements on rubber compounds have been made to develop information on the processes occurring in the vulcanization of rubber.



**Thermal Conductivity of Metals.**—Measurements were made on the thermal conductivity of 21 metallic alloys over the temperature range 100° to 500° C. Work is being continued to correlate changes in conductivity with structural changes in the metal, particularly in the case of nonferrous alloys.

**Heat Transfer by Convection.**—Work on this project has been supported by the McMillan fellowship of the Johns-Manville Corporation. Measurement by optical means of temperature distribution in air adjacent to heated surfaces, both plane and cylindrical, has made possible accurate calculations of heat transfers. This method is the only one thus far devised for measuring heat transfer between fluids and solids over definite small portions of the solid surface, and promises important practical applications.

**Intercomparison of Temperature Scales.**—An international comparison of temperature scales in the range 660° to 1,063° C. has been completed. As a result of this work the temperature scales of Germany, England, and the United States have been brought to agreement within 0.1° C. throughout this range.

**Standardization of Thermocouple Materials.**—An extensive study has been made of all the principal metals which are used for thermocouples. New reference tables have been developed for platinum to platinum—10 per cent rhodium, platinum to platinum—13 per cent rhodium and chromel-alumel thermocouples. The work is being extended to include copper-constantan and iron—constantan thermocouples.

**Extension of the Temperature Scale to -259° C.**—The increased industrial application of low temperatures has stimulated research in this field. In response to urgent requests, the bureau has undertaken the extension of the scale of temperatures from -190° to -259° C., and a temporary scale was established.

**Freezing Point of Iridium.**—A series of temperature measurements of the freezing point of iridium, which is of importance from the standpoint both of photometry and color temperature measurements, has been completed. The value for this temperature, based upon the freezing point of either gold or platinum, is 2,450° C. (4,442° F.).

**Electrical Properties at Liquid Helium Temperatures.**—It was found that certain metals called superconductors, which were known to lose their resistance at these low temperatures to the flow of direct current, also became superconductors for alternating currents of ordinary and radio frequencies.

#### HYDRAULICS

**National Hydraulic Laboratory.**—The hydraulic laboratory building was turned over to the bureau by the contractor on March 12, 1932. Since that time the members of the staff have been engaged with the design and installation of equipment.

Five centrifugal pumps having a total capacity of 58,000 gallons per minute, seven sluice gates, two cranes, one hoist, one 20-ton and two 9-ton scales for weighing water, a constant level tank, a volumetric tank, the piping for the pumps, the switchboard, transformers, and various pieces of instrumental equipment have been

purchased and are being installed. As soon as this equipment is in place it will be possible to start experimental work.

Plans are being prepared for the first research problem, a study of the flow of water around pipe bends, which is to be undertaken for the Bureau of Reclamation. A quantity of pipe and tubing of various sizes has already been purchased for this investigation. Changes in design standards for piping systems may grow out of this work.

**Plumbing Investigations.**—The permanent experimental equipment of the 100-foot tower, erected for an investigation of requirements for plumbing drains for tall buildings, was completed in July. Experiments to determine the capacities of sloping drains were begun in August, 1931, and measurements of flow in new cast-iron soil pipe from 2 to 5 inches in diameter with slopes varying from  $\frac{1}{8}$  to 2 inch fall per foot have been made. Similar measurements have been made on old cast-iron soil pipe, 12 years in service. A paper covering this phase of the investigation is in preparation.

A study of surging flow in sloping drains, produced by the intermittent discharge of plumbing fixtures, distributed from the second to the tenth stories of the tower, has been made to obtain an estimate of the relation of capacities under these conditions to the capacities of the same drains with steady flow. These studies have been practically completed on 4, 5, and 6 inch drains with slopes of  $\frac{1}{8}$ ,  $\frac{1}{4}$ , and  $\frac{1}{2}$  inch fall per foot. The results of these studies will be given in a second paper.

#### IDENTIFICATION OF GUNS, BULLETS, AND DOCUMENTS

**Assistance to the Federal Government.**—Forty-three different cases were handled during the year. The bureau's laboratory tests on bullets, handwriting, typewriting, and other forms of physical evidence submitted by Government agents, have saved large expenditures by narrowing investigations to definite fields. Cases are taken only when the Government is a party at interest, and court testimony is given only when necessary. Standards of practice have been entirely lacking in this field, and consequently the testimony of so-called experts has often been conflicting. The bureau is gradually developing practicable standards for identification work.

#### INSTRUMENTS AND APPLIANCES

**Calibration of Testing Machines.**—The bureau now has 10 proving rings with capacities up to 300,000 pounds. These have been used for periodic calibration of the testing machines of the Bureau of Standards and of other Government laboratories. They have also been used by members of the staff to calibrate machines used in special research work at the University of Wisconsin, Illinois Steel Co., Bethlehem Steel Co., Rensselaer Polytechnic Institute, and the Battelle Memorial Institute.

Forty-two proving rings, commercially manufactured, have been calibrated and certified for industrial and other laboratories from July, 1931, to July, 1932. The continually increasing use of proving rings shows that the development of this device by the bureau has



materially furthered the standardization of testing machines. Because it had been suggested that thermal lag might cause appreciable error in the use of these rings, apparatus was designed and built to determine the possible magnitude of this effect. It was found that even with the largest (300,000 pound) rings all thermal effects had become negligible in less than 50 seconds, which was about the minimum time necessary to take a reading during calibration. The thermal time lag in some other elastic calibrating devices was found to be four or five times as great.

**Instruments for Measuring the Tilt of Earth's Strata.**—In response to the desires of those interested in developing some instrumental means of predicting imminent earthquakes, two types of tiltmeter, based on optical interference, have been designed, constructed, and are being subjected to test in different localities. These instruments are theoretically capable of revealing tilts as small as one-tenth second of angle, and the laboratory tests corroborate this. If these instruments prove practicable, they should find application in other fields where small tilts of earth's strata under load are of importance.

**Accelerometers for the Study of Earthquakes.**—The development of accelerometers, for obtaining within the destructive area of major earthquakes data of value to the structural engineer, has been continued. Twelve sets of accelerometers, each indicating three components, were constructed and are being installed by the Coast and Geodetic Survey, and additional instruments of the same type have been ordered.

**Development of Seismometers.**—The results of work done at the bureau over a period of years on galvanometers and electrical recording of phenomena of various kinds have been applied very successfully in the development of improved seismometers and other instruments for studying the effects of earthquakes.

**Gages for Precise Dimensional Measurements.**—Two screw micrometer gages, having electrical contact indicating devices, were designed and built for use in obtaining precise dimensional measurements of test specimens used in a photoelastic study of rubber. These gages are generally applicable to the measurement of easily compressible materials.

**Device for Turning Spherical Surfaces.**—An attachment for turning spherical surfaces of large radius on an ordinary lathe has been designed and constructed. It can be readily adjusted to produce a surface with any desired radius of curvature greater than 20 inches. Although particularly designed for the production of lens-grinding tools, it promises to have other applications, as it performs work not possible with any other machine tool available on the American market.

**Impact Resistance of Screw Threads.**—The results of the few tests heretofore published indicated that the impact resistance of bolts was markedly different for different shapes of thread. However, no comprehensive investigation of this subject had been made. An investigation covering the three commercial thread forms—American national coarse, American national fine, and Dardelet threads, each in four different sizes and five different materials—has just been completed. Through the cordial cooperation of the United States Army



the specimens were tested in the large Charpy type impact machine at Watertown Arsenal. No other impact machine of adequate capacity was available in this country.

The results showed that for all materials the resistance of bolts having American national fine threads and Dardelet threads was considerably greater than that of bolts having American national coarse threads. American national coarse threads are used in most engineering machines and structures at the present time.

**Elevator Safety Interlocking Devices.**—The recent inclusion in the American Standard Safety Code for Elevators of performance standards and performance tests of elevator safety interlocks, previously developed, has resulted in an extension of their application. Type tests of additional devices have been made for the information of the Government departments, certain State governments, and other inspectional and regulatory bodies.

#### LEATHER

**Effect of Humidity on Leather.**—A study of the influence of atmospheric moisture on the properties of chrome and vegetable-tanned calf leathers was completed. It was found that the moisture content, strength, stretch, and area of these leathers increased as the moisture present in the atmosphere increased. The results emphasized the necessity of establishing standard testing conditions for leather, of controlling humidity in establishments making leather goods where accuracy of dimensions is required, and of studying the treatment of leather to minimize these changes. Chrome leather showed greater changes than vegetable-tanned leather.

**Acid in Leather.**—Evidence was obtained showing that the life of leather in the presence of sulphuric acid is influenced by the particular tanning material used. Tests on leather tanned with mangrove-bark extract showed it to be more resistant to deterioration, by sulphuric acid than leather tanned with chestnut-wood extract, and less resistant than leather tanned with quebracho-wood extract. Quebracho leather subjected to high temperature and humidity conditions deteriorated much more rapidly than when stored under ordinary room conditions. Studies were initiated of the effect of temperature on the deterioration of chestnut leather treated with sulphuric acid, the effect of oxalic acid on the deterioration of both chestnut and quebracho leathers, and the effect of sulphuric acid on leather tanned with sumac. All leather for this work is prepared in the bureau's experimental tannery. The results of this work are leading to the establishment of means for evaluating leather and producing leather of improved quality. This is a direct service to the industry, to the various Government agencies using leather, and to the public.

**Substitute for Sole Leather.**—A substitute soling material made from domestic raw products (heavy cotton duck and a synthetic resin) was developed. Laboratory tests indicated satisfactory wearing quality, and service tests are in progress on 100 pairs of soles at Fort Benning, Ga., to determine suitability of the material for military use.

## LIME AND GYPSUM

**Particle Size Distribution of Lime.**—The method of determining particle size by automatically weighing the material as it settles out of suspension has been found to be accurate for 10 micron particles, but there is a deviation with smaller particles which increases as the size of the particle decreases. The average particle size of the commercial hydrated limes studied is close to 5 microns.

**Volume Changes of Gypsum Fiber Concrete.**—The investigation of the volume changes of gypsum fiber concrete, made from five different calcined gypsums, was completed. This study included measurements of the expansion which occurred during setting and subsequently due to changes in moisture content, together with thermal expansion. The effects of the amounts of mixing water and of wood chips on the magnitude of these changes were investigated.

**Heat of Solution of Calcium Sulphate and Its Hydrates.**—Methods have been devised for preparing calcium sulphate and its hydrates of high degree of purity, and the heats of solution of these purified compounds in 2.00 *N* hydrochloric acid have been determined at 30° C. in especially designed twin calorimeters.

**Ammonium Acetate Solution as a Solvent for Gypsum Products.**—Rapid methods have been devised for determining the purity of gypsum plaster and the sand content of set gypsum plaster using a solution of ammonium acetate as a solvent.

**Keene's Cement.**—An investigation was made of the chemical and physical properties of nine samples of commercial Keene's cement. From the data obtained a proposed Federal specification for Keene's cement has been drawn up.

**Sand-Lime Brick.**—An autoclave, wherein mixtures may be filtered at elevated temperatures and pressures, has been devised and the solubility of silica in varying concentrations of lime water at elevated temperatures is being investigated.

## METALS

**Foundry Problems.**—Success in foundry casting operations is dependent in large measure on the running properties of the molten metal in filling the sand mold. As a result of an investigation covering the past two years, a report has been issued describing a practical method which can be used by the foundry worker for determining the behavior of the metal under conditions identical with those of casting.

Permeability is an important characteristic determining the usefulness of a molding sand since it is closely associated with the ability to carry off steam and other gases incidental to casting. A study showing the influence of grain characteristics, grain size, sharpness, etc., on the permeability of the sand is nearing completion.

In order to make available for practical use the large amount of information on the properties of commercial and special foundry sands obtained in cooperative work with committees of technical societies, as well as in tests carried out at the bureau, an information circular on this subject is being prepared.

The results of the recently completed study of the shrinkage of metals in cooling from the liquid state to room temperature, carried



out in cooperation with the American Foundrymen's Association, form the subject matter of several publications.

**High-strength Cast Iron.**—A comparatively simple means for the beneficiation of cast iron is one of the most important needs of this foundry industry. Some very promising results have been obtained in the preliminary work which has been done on the effect of controlled superheating prior to casting as a means of modifying the structure and improving the mechanical properties.

**"Gases" in Metals.**—This reaction—the carbon-oxygen reaction in molten iron—which is the basis of all steel-making processes, has been studied extensively. The experimental determination of the carbon-oxygen equilibrium in liquid steel at three different temperatures has been completed and the determination of the hydrogen-oxygen equilibrium is in progress.

Oxygen has been determined on several steels and irons, and these are now available as oxygen standards for analysts. Similarly, nitrogen has been determined in four of the bureau's standard sample steels, so that these steels will serve as nitrogen standards.

An extensive résumé of the literature was prepared as part of a symposium on the subject.

**Nonferrous Ingot Metals.**—A report was issued during the year showing the properties of red brass (Cu 85, Pb 5, Zn 5) poured at different temperatures and in test bars of various shapes. The effect of remelting and of impurities, such as sulphur, has also been studied. The results will serve in establishing a "base line" for the Nonferrous Ingot Metals Institute in classifying the numerous commercial variations of this alloy.

**Rail Steel.**—Previous studies show marked differences in the quality of rail steels by high-temperature tensile tests, which seem to have a direct bearing on the susceptibility of the rails to develop transverse fissures in service. To determine whether or not this apparent difference in quality or "secondary brittleness" is an inherent property of the steels or a function of the rate of loading, Charpy impact tests, impact-tensile tests, and torsion tests on the same steels have been made. No indications that "secondary brittleness" is not a property of the steel itself have been found.

**Bridge Wire.**—The study of the properties of heat-treated carbon steel wire which proved unsatisfactory in service for use as suspension bridge cables has been continued. Numerous tensile, torsion, fatigue, and "long-time" tensile tests on galvanized and ungalvanized wires, supplemented by microexamination, have shown that the presence of a galvanized coating, the rate of loading, and the imperfections in the surface of the wire affect the resistance to fracture of a heat-treated carbon steel bridge wire to a different degree from their effect on a cold drawn steel wire of similar composition.

**Effect of Temperature on Mechanical Properties of Metals.**—The study in cooperation with a joint research committee of the American Society for Testing Materials and the American Society of Mechanical Engineers of the embrittlement of "18 and 8" stainless steels by carbide precipitation at certain tempering temperatures has been completed. As part of the study of the deterioration and "creep" of Cr-Ni-Fe alloys at elevated temperatures, the influence of stress



upon the structural changes in these alloys when maintained at elevated temperatures for periods up to 1,000 hours has been determined. The fundamental aspects of the mechanism of "creep" of metals at elevated temperatures and the influence of grain size are being studied by means of single-crystal test specimens of several pure metals.

As part of a symposium on the general subject a critical review of the available information on the high-temperature properties of the rare and precious metals was prepared.

The general investigation has been extended to indicate the effect of low temperatures and the mechanical properties of a number of copper alloys and of stainless steel have been determined at  $-80^{\circ}$  and  $-190^{\circ}$  C.

**Machinability of Metals.**—Speed and quantity of metal removed are of great importance in all present-day shop machining methods. A study has been made of the influence of lathe-cutting conditions on the properties and structure of the machined surfaces of carbon and alloy steels to determine whether or not quality may be sacrificed for speed. The magnitude and depth of the work-hardening and other changes of the metal at the machined surface were determined.

It is now a well-established fact that steels of the same apparent composition may differ decidedly in properties, and this is of considerable practical importance in tool steels. Work is under way to define more precisely the cause of the so-called body or timbre of tool steels.

**Endurance of Metals.**—In the study of the metallurgical factors which may affect the endurance of steels, it has been shown by tests by the rotating-beam and axial-loading methods that a hot-dipped galvanized coating lowers the endurance limit in some cases by as much as 40 per cent. Electroplated zinc coatings did not have this effect. Methods have been developed to determine the endurance of wire to pulsating tensile stresses. This permits the testing of wires under actual service conditions and promised to be very useful for aircraft members.

The simultaneous action of corrosion and fatigue upon the endurance of metal structures is much greater than either alone and frequently leads to disastrous results. Work has been continued in the preparation of a concise summarizing report of the extensive experimental work on this subject carried out at the Naval Experiment Station.

**High-Frequency Fatigue Testing.**—A series of high-frequency fatigue tests made on light aluminum alloys, in cooperation with the National Advisory Committee for Aeronautics, has been completed and a report on the work is being prepared.

**Corrosion of Metals.**—The character of the surface film formed on a metal under atmospheric exposure is generally believed to be intimately associated with the degree of corrosion-resistance shown. The American Society for Testing Materials has under way an extensive series of exposure tests of commercial nonferrous metals in different parts of the country. Advantage has been taken of these tests to initiate a study of the films formed on different metals under various climatic conditions. Methods for removing the films intact have been developed and some work on the character of the corrosion film on copper has been completed.

Cooperation has been continued in the extensive series of exposure tests of galvanized materials, sponsored by the American Society for Testing Materials. The tests have shown that, contrary to popular conception, marine atmospheres are not nearly so severe as inland industrial atmospheres.

Methods in current commercial use for determining the relative corrodibility of stainless steels have been studied. Other laboratories have cooperated in the work under the sponsorship of the American Society for Testing Materials, and the combined results will show the usefulness and dependability of such tests.

The marked differences in corrosion of iron due to degree of aeration and pH of the water in closed water systems, previously noted, have been found to be less pronounced as the corrosion period is lengthened. Initial corrosion is greatly affected by these factors, however. The character of the rust scale, which may serve to protect the underlying metal, can be varied from loose flocculent to dense adherent scale by varying these factors. The second report on this study is in preparation.

**Prevention of Embrittlement of Sheet Duralumin by Atmospheric Corrosion.**—The five-year program of exposure tests in cooperation with the National Advisory Committee for Aeronautics, the Army Air Corps, and the Bureau of Aeronautics, Navy Department, has been completed. The degree to which heat-treated high-strength aluminum alloy sheet may become embrittled under different climatic conditions has been definitely established, together with the degree of inhibition of the attack which may be obtained by proper heat treatment. The relative merits of most of the common coating materials, together with the proper means of application, are well established. A new series of tests to cover materials developed since the first series of exposure tests, has been started.

The method of anodic-oxidation for the treatment of duralumin as a means of increasing its corrosion resistance has been studied. A rapid test for determining the quality of the "anodic" film is now available. The cause of the deterioration of the electrolytic bath used in the process and the accompanying inferior character of the surface films produced is under study.

**Test for Galvanized Coatings.**—In specifying the quality of the zinc coating of a great many galvanized steel products, especially wire, a half-century-old simple test consisting of immersion in a copper sulphate solution, is relied upon in spite of widespread adverse criticism. A study has been made of the limitations of this method and the reasons for the misleading results often obtained. The report which is nearing completion will show a suitable modification whereby dependable results can be obtained.

**Wear Resistance of Metals.**—By means of tests carried out in oxygen-free atmospheres the fundamental and practical importance of surface oxide films in determining the rate of wear has been clearly demonstrated. Under certain conditions in the absence of oxygen the metal-to-metal wear of steel was found to be excessive.

**Bearing Alloys.**—The cooperative study with the War Department of bearing alloys containing little or no tin has been concluded. The copper-lead mixtures received special attention during the year, and an "alloy" was developed which is decidedly superior to others in



commercial use in many respects. A report on the properties of the common tin-base and lead-base "Babbitts" at different temperatures has been published.

Additional studies have been made on the effect of impurities in bearing bronzes on their properties and performance.

**Copper Roofing.**—A report was issued on seam corrosion in materials of this kind as a summary of the work carried out in cooperation with the Copper and Brass Research Association. The degree of heating incidental to soldering is an important factor in determining the degree and extent of seam corrosion.

**Spring Materials.**—The American Society of Mechanical Engineers has assisted in the compilation of data by an extensive and critical review of work which has been done on the subject of materials for springs. The digest of the results now in preparation, which includes many unpublished data furnished by manufacturers, will constitute a convenient and important reference book on the subject.

**Spark Testing of Steels.**—A rapid, nondestructive test for establishing the identity of steels is an exceedingly useful works test. A survey has been made of the spark-testing method and the complete report now in preparation shows in concise graphical form the applicability and limitations of this testing method.

#### METROLOGY

**Comparison of Line Standards of Length.**—A recomparison of the bureau's secondary standards of length was completed during the year. Because of alterations in progress in the building, it was impossible to control the temperature in a satisfactory manner. Therefore, the results are not of as high precision as has been obtained in some of the previous comparisons. However, sufficient accuracy was obtained to meet immediate needs. The results may be summarized as follows:

1. The secondary and working standard meter bars have not changed in length by more than 0.2 micron since the last previous comparison.

2. The invar meter bars, measured in 1924 and again in 1929, have shortened several microns during the past eight years. This result was unexpected, as invar bars usually lengthen with time.

3. Data were obtained on the stability of a "Fix-invar" meter bar. This investigation will be continued, and the coefficient of thermal expansion of the bar determined.

4. Measurements are nearing completion on a series of four-decimeter bars used in the length measurement laboratory and on a series of decimeter bars of stainless steel ruled in the bureau's interferometry section. No significant changes have occurred in any of these standards.

5. Platinum-iridium meter bar No. 21 is now at the International Bureau of Weights and Measures for recomparison with the international standard.

**Composition, Heat Treatment, and Mechanical Treatment of Low Expansion Alloy.**—The bureau has cooperated with the United States Coast and Geodetic Survey and with a manufacturer in an effort to obtain a material that will be more suitable than present-day invar



for geodetic tapes. Some progress has been made and it appears probable that a satisfactory material and heat treatment may be developed.

**Precision Circles.**—The bureau has cooperated with the United States Coast and Geodetic Survey in the design, construction, stabilization, graduation, and calibration of precision circles such as are used in the Parkhurst (C. & G. S.) theodolite. Patterns of an improved design have been made, and bronze castings have been prepared, which, after being machined, heat treated, and graduated, will be studied over a period of time to determine their dimensional stability. Another pattern will be finished especially for casting silver circles in order to make a similar study of the stability of this material which is now being considered for use by the Coast Survey.

**Precision Dividing Engine.**—The precision dividing engine designed and built at the bureau received a preliminary test and gave excellent performance. A diffraction grating was ruled which was exceptionally free of scattered light. Some "ghosts" were found, but these may be eliminated. The production of suitable gratings is the next problem to be solved in the advancement of research in atomic physics. This machine gives promise of being a valuable contribution in this field.

The data secured in the construction of the machine have a very important bearing on the design and construction of all similar equipment.

**Use of Light Waves for the Production of End Standards.**—To compare the accuracy of end standard calibration, 16 decimeter end standards of fused quartz, as nearly perfect as possible, are being constructed and measured and will finally be submitted to the principal national laboratories for their calibration. It is hoped to reduce all errors of plane parallelism of the ends and of the length to less than one-millionth of an inch before the final calibrations are made.

#### PAPER

**Preservation of Records.**—Studies of the manufacture of record papers from the commonly used materials resulted in development of further information as to the permanence qualities inherent in different grades of fibers and the optimum manufacturing details for conservation of their initial quality. Tests of commercial papers, made during the four years of this research, show that these studies are promoting paper-making standards which are improving the stability of the various grades of record papers and decreasing their cost through more efficient use of raw materials.

With the completion of surveys of libraries relative to storage of records, experimental laboratory tests were made to determine the effects on record papers of air polluted with acid from the combustion of fuels, and of sunlight—apparently the most potent external deteriorating agents. The results definitely confirmed observations in libraries and analytical studies of duplicate books from libraries in different localities. Resultant recommendations as to purification of air and protection of records from sunlight are being applied in libraries. They were followed in full in the plans for the National Archives Building.

Based on the results of this research as a whole, a classification of record papers, relative to the life requirements of the various classes of records, has been formulated. Application of this by Government departments and many outside organizations has improved the quality of their permanent record papers, while effecting economy through better selection of the other classes of papers.

The cost of this research has been shared about equally by the Carnegie Foundation of New York, the Brown Co., and the Government.

**Government Papers.**—Cooperative research on paper currency with the Bureau of Efficiency and Bureau of Engraving and Printing was continued. Additional grades of rag and wood fibers proposed for use in currency paper were studied by means of paper-making experiments and trial printings. Information of this kind makes economies possible and provides data on substitute materials which are available in case of emergency. Further study was made of use of protective coatings for improving the wear quality of paper currency.

The cooperative research with the Bureau of Engraving and Printing on materials and processes used in manufacture of postage stamps was continued.

**Printing Quality of Lithographic Papers.**—Since misregister is responsible for very great waste in the lithographic-printing industry, and constitutes the most serious printing difficulty in which paper is a factor, extensive studies are being made to develop information relative to the causes of register troubles. The work has included not only extensive laboratory analyses and tests of lithographic papers but printing plant studies of the factors affecting the closeness of register and the response of a series of specially prepared papers of known history to those factors. It is hoped by these means to establish standards for paper properties that will minimize misregister.

Seventeen different factors affecting register have already been detected, and the influence of each is being studied in its relation to difficulties encountered in commercial practice. Important information relative to the effects of moisture variables has been obtained and improved procedure in handling and conditioning papers in the printing plant has been developed. The work is being done in cooperation with the Lithographic Technical Foundation.

#### PHOTOGRAPHY

**Photographic Sensitometry.**—In connection with the international standardization of sensitometric methods a study is being made of several developing agents and of the effects of variations in the composition of the developing solutions.

The Eighth International Congress of Photography (August, 1931) formally adopted as an international standard filter for use in the sensitometry of negative materials, one of the Davis-Gibson light filters which were developed in this laboratory. The International Commission on Illumination also has adopted (1931) three of these filters as standard, for use in colorimetry.



**Photographic Emulsions.**—In investigations directed to the understanding and improvement of photographic emulsions, it has been found that gelatin forms a nonionized compound with the silver, in appreciable quantity, under emulsion conditions; that sensitivity of emulsions, free of dyes, is little affected by large changes in silver ion concentrations; that the desensitizing action of soluble bromides increases with the acidity of the emulsion; and that bathing with ammonia leaves the emulsion with an excess of silver over halogen.

#### PHYSICAL CONSTANTS

**Absolute Determination of Gravity at Washington.**—This work, which has been under way for several years, is nearing completion, and will probably be finished during the next year. Its purpose is to determine with all the precision possible the value of gravity at the Washington base station of the Coast and Geodetic Survey.

**Absolute Viscosity of Water.**—In cooperation with the Chemical Foundation, work on the determination of the absolute viscosity of water has been commenced. The viscosity of water is a primary working standard for all practical viscosity measurements and its accurate determination is of great importance. A new system of preparing satisfactory capillaries has been devised and several new methods of measurement have been developed.

**Refractive Index of Distilled Water.**—Water is one of the refractometric standards, but extant data thereon are relatively very discordant. Using apparatus and technique developed for refractometric measurements of high precision, the refractive properties of water have been determined for several wave lengths of the visible spectrum at 5° intervals in the temperature range 0° to 60° C. The results are referred to a standard of dry air at standard pressure and at the temperature of the water. These data are considered as accurate within  $\pm 0.000003$  in index.

**Thermal Properties of Oils.**—Experimental work on this project, previously supported by the American Petroleum Institute, was concluded. It was found possible to infer a reliable value for the specific heat of any petroleum oil in terms of easily measured properties, such as density and viscosity or volatility. New tables of specific heats of petroleum oils were prepared.

**Isotopes of Hydrogen.**—The bureau, in cooperation with the staff of Columbia University, has discovered an isotope of hydrogen, a new kind of hydrogen twice as dense as the ordinary gas. The new substance fills a previous gap in the series of primitive elements, and its discovery may throw important light on the ultimate constitution of matter.

**Pressure-Volume-Temperature Data for Gases.**—A twin-bomb method was developed for the accurate measurement of P-V-T data for gases.

**Coefficient of Thermal Expansion of Benzoic Acid.**—With the aid of a novel type of gas-filled pycnometer, this coefficient was determined between 15° and 30° C.

**Crystallography of Organic Compounds.**—The optical properties of crystalline organic compounds have been determined, photomicrographic technic at low temperatures has been developed, detailed



study of formates has been made, and a chemical microscopical study of special materials completed.

**Phase-Equilibrium Diagram for the System  $\text{SiO}_2\text{-ZnO-Al}_2\text{O}_3$ .**—The complete phase-equilibrium diagram for this system has been determined. This is the important system in zinc retorts.

**Ultra-Sonic Waves.**—An investigation of the speed of travel of ultra-sonic waves in various organic liquids has been completed and published. This work supplements other investigations at the bureau on the mechanical and electrical properties of electrical insulating materials.

#### PROTECTIVE COATINGS

**Soil Corrosion Studies.**—The investigation of the relation of soils to underground corrosion begun in 1922 has now reached a stage where some definite conclusions can be drawn, although the last of the specimens originally buried will not be removed until 1934.

Soils containing considerable quantities of soluble salts or acids are nearly always corrosive, as are heavy clays which shrink badly on drying.

Two fairly satisfactory methods for identifying corrosive soils in the field have been developed.

The ferrous pipe materials commonly used have been found to behave similarly under similar soil conditions, but the corrosion products of cast materials differ somewhat from those of wrought materials.

**Protective Coatings for Pipe Lines.**—With the active cooperation of the American Gas Association and the American Petroleum Institute, tests of many types of pipe coatings of commercial importance are in progress. These tests include both laboratory measurements and field experiments with practical coatings in parts of the country where pipe lines deteriorate rapidly. Testing methods have been devised which make it possible to determine where coatings are economic, and the experiments in progress have already shown what types of coatings give enough protection to be worth their cost.

Poor application and lack of care in handling have been found to account for many coating failures. In certain regions soil stress results in the distortion and failure of unreinforced bituminous coatings.

**Protective Value of Electroplated Coatings.**—In cooperation with the American Electroplaters' Society and the American Society for Testing Materials, over 8,000 steel specimens have been plated under definite conditions. These are now exposed in six localities, and are inspected at regular intervals to determine their resistance to atmospheric exposure.

**Chromium Plating.**—At the request of the Bureau of Engraving and Printing, a consistent theory of chromium plating was developed for the first time. It clarifies the subject and should lead to improvements in existing methods.

#### RADIO

**Primary Frequency Standards.**—The accuracy of this standard was increased to 1 part in 10,000,000, as the result of extremely pre-

cise studies of the functioning of the various elements of the standard. An auxiliary unit was constructed to guard against stoppage of the four original oscillators, and special equipment was installed to protect against failure of the power supply.

**Secondary Frequency Standards.**—Piezo oscillators of extremely constant frequency were designed and constructed. They are of wide application as standards and as control units for radio transmitters.

**Standard Frequency Disseminations.**—The standard frequency service was markedly improved. Regular transmissions were provided on a frequency of 5,000 kilocycles per second for four hours every Tuesday. The accuracy was better than 1 cycle per second (1 part in 5,000,000). Some of the transmissions were controlled by wire-line transmission of a frequency from the national primary standard.

**Measurement of Radio Field Intensity.**—Methods and apparatus were developed for the automatic recording of the field intensities of distant radio stations. These methods were applied to a study of the effects produced by the synchronization of two pairs of broadcasting stations. A research on the accuracy of measurement of field intensity and on short-distance absorption of radio waves was completed.

**Measurement of Height of Ionized Layer.**—The ionized layer in the atmosphere, more than 70 miles above the ground, has been determined to be the major determining factor in the long-distance transmission of radio waves. The measurement of height of this layer is of primary importance in interpreting transmission conditions and increasing our knowledge of radio wave propagation. Such measurements were made on one day each week. Improved equipment was designed for such work. This included an automatic recorder, which will allow continuous measurement of the height in the future.

#### RUBBER

**Chemical Nature of Rubber.**—The bureau's research has established the crystallinity of rubber hydrocarbon. The refractive indices and melting point (10° C.) of crystalline rubber have been determined. Accurate chemical analyses have also been made. This is the first time that any such values have been obtained.

**Insulating Properties of Rubber.**—To determine the properties of pure rubber, about 10 kilograms of rubber hydrocarbon have been prepared by digestion of latex at high temperatures, while a smaller sample has been purified by treatment with the enzyme trypsin at room temperature. Specimens of these materials have been prepared to check determinations already made of dielectric constant, power factor, and compressibility of rubber compounds.

**Rubber Balloons.**—A study of sounding, pilot, and ceiling balloons used by the Weather Bureau resulted in improved life and quality of the balloons purchased and provided data for calculating the performance of the balloons in the upper atmosphere.

**Information on Rubber.**—Publications on reclaimed rubber and rubber latex were prepared and issued to meet requests from the industry and the public for general information on these subjects.



## SAFETY STANDARDS

**Electrical Codes.**—A 1932 edition of the Electrical Code, combining accident-prevention and fire-prevention features, was issued. Work on revision and interpretation of the National Electrical Code has been almost continuous. A revision of the Code for Protection Against Lightning has been completed. Definitions of electrical terms have been standardized through the activities of a national committee on electrical definitions which arose from the work on codes.

**Safety Codes.**—Members of the bureau's staff have participated in the work of the National Safety Code Correlating Committee and in the work of various committees of national scope which have prepared safety codes. Formulation of codes for walkway surfaces; cranes, derricks and hoists; and for accident reports and statistics, has been under way. Revision of codes dealing with school lighting; mechanical refrigeration; brakes and brake testing; elevators, dumb-waiters, and escalators has received attention and two of these revisions have been completed. An elevator inspectors' handbook is practically completed. A new edition of Safety for the Household was issued. Assistance was given State officials in preparing regulations.

**Safety Code for Industrial Workers in Foundries.**—The bureau cooperated during the year in the preparation of a safety code for the protection of industrial workers in foundries, a project sponsored by the American Foundrymen's Association and the National Founders Association, and approved by the American Standards Association.

## SCALES IN RAILROAD, INDUSTRIAL, AND OTHER SERVICES

**Master Scale Calibrations.**—Each of the 19 master track scales which afford various railways, State departments, and industrial organizations means for periodically verifying the weight value of their railroad track scale testing standards, was calibrated. Two of these scales received supplementary calibration following completion of extensive modifications recommended by the bureau on the occasion of the regular annual calibration. The grade of weighing accuracy exhibited by each master scale on final calibration was within the tolerance applied (approximately 0.01 per cent). A new master scale installation was completed on the Norfolk & Western Railway and was placed in service following formal calibration.

**Tests of Railroad Track Scales.**—A total of 959 railroad track scales was tested during the fiscal year 1932. Of these, 768 scales, or 80 per cent, were correct within the allowable tolerance of 0.20 per cent. For the entire group of scales the average indicated weighing error was 0.17 per cent. As a general index to the probable grade of accuracy obtainable in weighing railroad freight cars throughout the United States, the above data represent a somewhat higher standard of performance than has heretofore been displayed. Of the railroad-owned scales, 81.4 per cent were correct within tolerance, the average error for the lot being 0.15 per cent. Of the privately owned scales, 77.6 per cent were correct, and the average weighing error was 0.20 per cent.



**Track Scales in Grain Weighing Service.**—Pursuant to recommendation of the Interstate Commerce Commission (Docket 9009) the standard of accuracy according to which railroad track scales in grain-weighing service are graded as satisfactory or unsatisfactory allows a mean maximum indicated weighing error equivalent to 0.10 per cent. In the past year 72 track scales subject to this special tolerance were tested. Sixty-four per cent were accurate within the required tolerance, and the average error for the group was 0.13 per cent.

**Test Car Calibrations.**—Sixty calibrations of track-scale test-weight cars were made on the master scale at Clearing. These were made on 27 different cars owned by 15 different organizations of whom 13 were railroads. In addition, 41 track-scale-test cars were verified in the field. Demands for this form of calibration service are such that the field equipment is customarily routed so as to provide this service at certain railway centers each year. The accuracy of the results obtained is by no means comparable to that obtainable on a master scale.

**Tests of Mine Scales.**—The mine-scale-testing equipment was operated in the coal mining regions of Indiana, Ohio, Kentucky, and West Virginia. A total of 145 tests was made. Fifty-four scales, 37.2 per cent of the total number tested, were within the tolerance of 8 pounds per ton of applied load; 91 scales, 62.8 per cent, were not within the tolerance. Study of the test data and inspection findings has indicated that the principal factors responsible for weighing inaccuracies in these scales were faulty installation practices and lack of adequate maintenance and repair measures.

**Paints for Test Weights.**—An investigation begun two years ago and having for its purpose the study of weight constancy in paints used on 50-pound test weights was brought to completion. A summary of the results of this study, made on some 200 test weights, with 10 varieties of coating, and subjected to eight distinct kinds of service or exposure conditions, shows that paints of light body vehicle, such as varnish (pigmented or unpigmented), form the more satisfactory surface protection.

#### SIMPLIFIED PRACTICE

**General Conferences; Recommendations Approved by Industry; Printed Recommendations.**—Twelve new simplified-practice recommendations were developed by general conferences, increasing the total to 161, exclusive of one regional recommendation and one limitation of variety recommendation. Both the latter and 135 of the 161 simplified-practice recommendations have been approved and accepted by the industries affected. Seventeen recommendations are in process of acceptance. To date, recommendations covering 127 commodities have been issued in printed form.

**Revision and Reaffirmation Conferences.**—Twenty-nine existing simplified-practice recommendations were reviewed by their respective standing committees. Of these, 13 were revised and 16 were reaffirmed without change. During the previous year, 32 of the 38 recommendations reviewed were reaffirmed.

**Preliminary Conferences and Variety Surveys.**—Sixteen preliminary conferences were held to discuss the simplification of 10 different commodities. Surveys of existing diversification of product have been conducted by simplified-practice committees appointed by 5 of these industries, and plans were started for similar activity by the other 5 groups.

**Identification of Simplified Practice Recommendations in Trade Literature.**—The general increase in consumer demand for products carrying labels or other marks identifying such products as conforming to nationally recognized standards and specifications has been reflected in the correspondence received by the bureau. Organized consumers, such as purchasing agents, architects, engineers, contractors, and merchants, have been seeking the adequate identification of simplified lines in trade literature. The bureau's work in transmitting these requests to the producing element of the various industries accepting simplified-practice recommendations, has resulted in approximately 300 manufacturers inserting items in trade literature to identify the simplified commodities. This action to facilitate the selection and purchase of simplified lines is indicative of a trend toward greater adherence to the various simplified-practice recommendations by the manufacturers, distributors, consumers, and other interested parties.

**State-wide Simplification Programs.**—Three years ago, the California State Chamber of Commerce organized and sponsored a simplified-practice committee, the purpose of which is to disseminate information concerning currently active simplified-practice recommendations, and to extend the application of simplified practice to commodities produced and used in that State. The chamber, in a recent report, estimated that, as a result of their work in applying simplified practice, California industry and commerce will benefit to the extent of \$10,000,000 a year. The bureau has extended its cooperative services to the California State Chamber of Commerce since the inception of this state-wide simplification program.

It is significant that, as a result of the California program, plans for organizing similar state-wide simplification programs are now being considered in several States.

#### SPECIFICATIONS

**National Directory of Commodity Specifications.**—In April, 1932, there was issued the second revised edition of the National Directory of Commodity Specifications, the first edition of which was issued in August, 1925. The new edition contains 548 pages as compared with 379 pages in the earlier edition. In it are briefly summarized as to technical characteristics, scope, and special applications, all nationally recognized standards and methods of test for commodities regularly produced in this country. It covers all of the commodity specifications adopted by national technical and trade associations, and those agencies which speak with the authority of the Federal Government as a whole.

**Encyclopedia of Specifications.**—Manuscript for the third volume of the encyclopedia series, entitled "Standards and Specifications for Metals and Metal Products," was prepared for publication and



sent to the Government Printing Office in June, 1932. This is a companion volume to "Standards and Specifications in the Wood-Using Industries" and "Standards and Specifications for Non-metallic Minerals and Their Products" issued in October, 1927, and April, 1930. It is estimated that the book will occupy 1,056 pages, as compared with 359 and 689 pages in the earlier volumes of the series.

**Facilitating the Use of Specifications.**—During the year, lists of sources of supply of commodities guaranteed to comply with the requirements of 349 Federal specifications and 32 commercial standards were compiled and distributed to 8,500 agencies making their purchases out of tax moneys—Federal, State, county, and municipal. These lists represent 17,960 requests from 7,878 firms, as compared with 13,956 requests from 5,789 firms in 1931.

**Federal Specifications for Rubber, Textiles, Paper, and Leather.**—During the year, the committees on rubber and leather products and packing materials, whose chairmen are members of the bureau, have prepared 35 specifications, and the bureau has assisted in the preparation of 45 specifications for textiles, 10 for paper, 40 for rubber goods and packing materials, and 3 for leather. This work involves a certain amount of experimentation and a large amount of testing.

#### SPECTROSCOPY, ATOMIC STRUCTURE, AND RADIUM

**Spectrochemical Analysis.**—This method, the most rapid and accurate yet developed for determining small magnitudes of impurities, has been used for a variety of industrial materials where deleterious effects of small amounts are of importance. For example, of the "proof gold" tested for the United States Mint, one sample showed total base metal impurities having the low magnitude of 23 parts in 1,000,000. To improve spectroscopic data for purposes of such chemical identification, entirely new spectroscopic measurements have been made for several elements.

**Concentration of the New Isotope of Hydrogen in Water.**—By fractional electrolysis, the concentration of the hydrogen isotope of mass 2 in water has been raised from one part in 30,000 to 2 parts in 1,000. The water containing the higher concentration of this isotope has a density greater than that of ordinary water by 16 parts in 100,000.

**Grading High Voltage X-Ray Emission.**—By means of a new voltmeter operating up to 250,000 volts, it is found possible to relate the energy output of an X-ray tube to the effective voltage applied to the tube. By this new method, all X-ray generator outputs may be expressed in terms of a single standard, thus bringing to the medical profession a much needed control in the application of X rays. This work was carried out in cooperation with the Radiological Research Institute.

**X-Ray Investigations.**—An investigation of the X rays generated in very thin metal foils has clarified the fundamental laws of X-ray emission. Two new instruments, an electrostatic voltmeter and a sensitive manometer, were designed, and an investigation describing volume color changes and surface chemical changes due to the bombardment of metal with cathode rays was published.



**Radium Tests.**—Fifteen hundred radium preparations were tested, having a radium content of over 17 grams and a market value of about \$1,200,000.

#### STONE

**Building Stone.**—Seventy-five samples of stone were tested for Government departments and thirty-seven samples for the public. The work on some of these materials involved lengthy investigations, such as: The cause of decay in the interior marble of a post-office building; determination of the physical characteristics of 14 samples of stone from Montana for the United States Engineer Office in connection with the flood control act of May 15, 1928; study of stone preservative treatments at the instigation of Public Buildings and Public Parks and the National Park Service; and the study of a peculiar type of discoloration on limestone which was causing considerable trouble.

An investigation of the commercial granites of this country has been started. This is concerned with the physical properties, weathering characteristics, and other practical considerations. Sixty samples have been collected from Maine, Vermont, New Hampshire, Massachusetts, Connecticut, North Carolina, South Carolina, Georgia, Wisconsin, Minnesota, and Texas.

**Plastic (Caulking) Cements.**—The procedure developed at this bureau is now being used for testing practically all materials of this type used in Government construction. Some of the large manufacturers of these products have installed testing equipment and are using the bureau's procedure to control their processes. In the past year 345 samples have been tested for Government departments.

**Slate.**—The investigation of slate has been completed and the results of this study appeared in the September, 1932, issue of the *Journal of Research*. This paper contains the results of strength, elasticity, toughness, hardness, absorption, porosity, and weathering tests on the important commercial slates of this country. The outstanding result of this study was the discovery of the nature of a weathering process which is largely instrumental in bringing about the decay of this material. Laboratory procedures have been developed by means of which the weathering qualities of a slate in question can be determined.

#### SUGAR

**Crystalline Gluconic Delta Lactone.**—A new method was developed for the separation and purification of the delta lactone of gluconic acid, a substance heretofore unavailable for use in the arts. It is potentially a weak acid, which will undoubtedly prove of value for many purposes, as in dyeing, tanning, baking powders, etc. Crystalline gluconic delta lactone may be prepared by the new process in quantity at a fairly reasonable cost.

**Crystalline Xylonic Lactone.**—A quantity of crystalline xylonic lactone was prepared by a simplified method from the product obtained by the electrolytic oxidation of xylose. Previously xylonic lactone had been prepared only in small quantity by a very expensive method.

**Oxidation of the Sugars.**—As fundamental contributions, it was shown that the first step in the oxidation of a sugar with bromine water is not the sugar acid, as formerly believed, but the delta lactone; it was found that the beta form of glucone is oxidized about forty times as fast as the alpha form; and that the oxidation of a sugar solution proceeds rapidly until the beta form of the sugar in solution is used up and then more slowly as the alpha form continues to be oxidized.

**New Compounds of Mannose.**—A full series of well-defined crystalline halogen acetyl derivatives of mannose has been prepared and their properties determined. These data are of a permanent value for general application. They have been used at the bureau to study the possible relationship of optical rotation and atomic dimension, and, in addition, for pointing out the possibility that the principle of optical superposition by van't Hoff is not an approximation (as is generally adopted) but an accurate rule.

**Properties of Levulose.**—The investigation of the fundamental properties of levulose and the selective reduction method of analysis have been completed. The data acquired have been applied to the analyses of crude materials which contain levulose. Particular attention has been given to the juices of the Jerusalem artichoke and the products derived from it during the course of manufacture of levulose. The methods have also been applied to honey and fruits. In most fruits levulose has been found to be the predominating sugar.

**Commercial Production of Levulose.**—The extracting and precipitating end of the plant was operated in two major periods, studying methods of juice extraction and of operating the conversion process. The methods of extracting the juice from fresh artichokes by pressing, and from dried chips by diffusion, have been compared. The major plant improvement this year has been the design and construction of a battery of a size to operate continuously with the rest of the plant.

**Color in the Sugar Industry.**—In the past year methods have been developed for measuring the color of sugar products upon a spectrophotometric basis that are comparatively inexpensive, simple of operation, and that yield satisfactory results. This has been accomplished by the development of a simplified spectrophotometer consisting of a Duboscq type of colorimeter illuminated by means of a mercury arc. Suitable filters used at the eyepiece to isolate chosen spectral lines and standards to be used in the calibration of the instrument have been perfected.

#### TEXTILES, DYES, CLEANING, ETC.

**Durability of Carpets.**—The carpet-wear-testing machine, previously devised, was applied to the evaluation of rugs and carpets of known relative serviceability in order to correlate laboratory accelerated tests with use. Manufacturers took an active interest in this work and furnished the materials. The Federal Specifications Board's technical committee on floor coverings cooperated by conducting practical service tests on some 32 specimens representative of the important grades. Although the practical tests have not been



completed, the machine tests are in excellent agreement with the serviceability of the specimens so far as it is known. The machine was also applied to systematic studies of rug constructions as to height of pile, density of pile, and grade of wool in the pile. The results should make it possible for the manufacturers to produce the most serviceable rug for a given price.

**Manila Rope.**—A method for the evaluation of the color of manila rope fiber was developed at the request of the Cordage Institute and the cordage committee of the Federal Specifications Board for inclusion in Federal specifications, and for use in the control of production of rope for commercial use.

**Cotton Textiles for Aeronautics.**—The work on aeronautical textiles was carried out at the request of the Bureau of Aeronautics, Navy Department, and the National Advisory Committee for Aeronautics. It resulted in the weaving in the bureau's cotton mill of gas-cell fabric and outer cover cloth for airships, each of which has a resistance 10 times that of the fabrics now used. Sufficient material was produced for large-scale tests. These tests are now in progress at the plant of the Goodyear Zeppelin Corporation.

A systematic study of the mercerization of cotton for aeronautical uses was completed. Ordinary commercial mercerization has as its object improvement in the luster and appearance of cotton. Little attention is given to effect on strength and weight. This study demonstrated that the optimum conditions of mercerization for increasing the strength of yarns are different from those of ordinary commercial mercerization. An increase of 50 per cent was found possible. Yarns mercerized under these conditions should have advantages for numerous uses where high strength is required.

**Dry Cleaning Solvents.**—At the request of the National Association of Dyers and Cleaners and of several machine manufacturers a study was made of the use of carbon tetrachloride, trichloroethylene, and Stoddard solvent as dry-cleaning solvents. The possible effect on clothing fabrics and on equipment, and the cleaning efficiency were studied. Work on the toxicity of the solvents was started in cooperation with the Public Health Service, Treasury Department. The need for this work arose from the possibility of finding safer or more efficient dry-cleaning solvents, because of the commercial availability of noninflammable liquids, and from the rapid increase in the production of dry-cleaning equipment and the use of these liquids in large and small cleaning plants and in the home.

**Serviceability of Bed Sheets.**—The Cotton Textile Institute and Associates for Government Service have been conducting practical service tests of some 24 brands of sheets in New York State public institutions with the object of finding out what types of sheets give the most service. Physical tests of the original sheets and of sheets taken from service after 35 and 65 launderings were made by the bureau for this study. The results should have considerable value to private as well as to public purchasers.

**Wool Processing.**—In cooperation with the American Association of Textile Chemists and Colorists and the Textile Foundation, the electrophoresis cell was found to be a new and valuable tool in the study of wool processing. With it the isoelectric point of wool, a



fundamental characteristic of practical importance in scouring, carbonizing, dyeing, and finishing, was determined accurately. The application of the cell to several wool-processing problems is well under way.

**Substitute for Shellac in Army Hats.**—A domestic synthetic resin was applied as a stiffener for felt hats used by the Army. Service tests demonstrated that this resin may be used with success as a substitute for shellac.

#### THERAPEUTIC ACCESSORIES

**Ultra-Violet Window Glass; Sources of Ultra-Violet Radiation for Health Purposes.**—The bureau has cooperated with the Council of Physical Therapy of the American Medical Association in obtaining data and preparing specifications relative to the minimum transparency to ultra-violet solar radiation permissible in window glass. Likewise, various artificial sources of ultra-violet radiation were investigated, and the radiometric and physiologic data correlated, in order to establish a minimum permissible intensity.

**Development of a Standard Ultra-Violet Dosage Intensity Meter.**—The use of sources of ultra-violet radiation for health purposes has created a demand for a reliable method of measuring and standardizing the dosage intensity of ultra-violet rays. Various methods of measuring the ultra-violet output of sources of radiation were investigated and a balanced thermocouple and filter radiometer was developed which, judged by the simultaneous radiometric and physiological (erythema) tests, satisfies the requirements of a standard laboratory ultra-violet dosage intensity meter.

#### TIME MEASURING AND RECORDING INSTRUMENTS

**Study of Watch Rates.**—In cooperation with a manufacturer of high-grade watches an investigation has been carried out to determine the extent to which the time-keeping quality of watches can be improved by the use of an elinvar hairspring and uncut monometallic balance wheel, in place of the usual steel hairspring and bimetallic balance wheel. The results obtained so far are very encouraging and appear to indicate that a material improvement in uniformity of rate may be secured by this means.

**Horological Institute of America.**—The bureau has continued to cooperate with the Horological Institute of America by participating in its committee work and by testing the watches submitted by individuals seeking to obtain certificates of the institute. During the year certificates have been issued to 56 junior watchmakers and 32 certified watchmakers.

**Testing of Timepieces.**—The bureau's circular on testing of timepieces was brought up to date and published during the year.

#### WASTE PRODUCTS FROM THE LAND

**Insulating Board from Cornstalks.**—The processes and board forming machine devised and tested semicommercially in cooperation with Iowa State College at Ames, Iowa, are now in industrial use.

Boards from mixtures of cornstalks and straw are being made and tested in the bureau's semicommercial plant.

**Pressed Boards from Cornstalks.**—Processes have been developed whereby the pressure required in the manufacture of pressed board has been lowered from the usual 500 to 70 pounds per square inch. Cornstalk bookbinders board so made and having over three times the standard strength was satisfactorily bound in book covers. An electrical resistance method for measuring dryness was developed. Mixed cornstalk-straw pressed boards are being made and tested. A machine is being built to add to the bureau's insulating board machine to make pressed boards continuously in semicommercial operations.

**Paper from Cereal Straw.**—In attempts to use the 50,000,000 tons of straw grown and wasted on American farms annually, strong light colored kraft pulp and paper in over 40 per cent yields have been made from wheat, oat, and rye straw. The economics of the processes and commercial applications will be investigated.

**Xylose from Cotton Seed Hull Bran and Cornstalks.**—Studies in medical laboratories of the effect of xylose on the human system and of its industrial utilization are being continued. A simplified process with cornstalks gave about 15 per cent yields of xylose and also 36 per cent of high-grade alpha cellulose whose usefulness in the rayon industry will be studied.

**Textile Sizing from Sweetpotato Starch.**—Sweetpotato starch can be produced economically in the South in competition with imported materials. Textile sizing made from sweetpotato starch, and the physical properties of the sized yarns, are under test by the bureau's staff in cooperative studies in the semicommercial textile mill of the Alabama Polytechnic Institute and local textile factories.

**Adsorption-Desorption Studies.**—The adsorption and desorption of water by cellulose products are being studied to determine the fundamental laws governing such phenomena; to develop standard tests for the absolute moisture content of paper, textiles, etc.; and to solve many practical problems arising out of the interaction of water with such materials. Preliminary experiments indicate that the results may be vitiated by such factors as the decomposition of the cellulose, and methods are being devised to obviate such possibilities in future studies.

#### WEIGHTS AND MEASURES

**Certification of Master Gages.**—The retest and certification of the American Petroleum Institute's grand master and regional master cable tool-joint gages were completed during the year, after lead errors in some of the ring gages had been corrected by the manufacturer.

In addition to the usual number of screw-thread gages, precision gage blocks, penetration needles, polariscope tubes, etc., several helicoidal transmission gears were submitted for determination of helix angle. Several of the current models of automobiles employ constant mesh helicoidal transmission gears, and in order to obtain quiet operation and minimum wear of the gears it is necessary that the helix angle of mating gears be held to very close limits. Commercial apparatus for measuring helix angle of such gears appar-



ently is not sufficiently accurate for the purpose. Hence the bureau is called upon to assist industry in these important and difficult measurements.

**Cooperation with the National Physical Laboratory and the Physikalisch-Technische Reichsanstalt.**—The appointment by the American Petroleum Institute of the National Physical Laboratory of England, and the Physikalisch-Technische Reichsanstalt of Germany as official testing agencies for A.P.I. gages made in Europe, has led to the exchange of information with regard to methods of testing A.P.I. gages, and correspondence with regard to interpretation of A.P.I. specifications. The Physikalische-Technische Reichsanstalt has adopted several of the inspection methods developed at the bureau. Steps have been taken by the American Petroleum Institute to clarify specifications and standardize methods of measurement where necessary so that measurements will be on the same basis in all laboratories.

**Screw Thread Survey.**—The American national standards for screw threads, as established by the National Screw Thread Commission, have been in use for something over 10 years, and in order to determine what changes, if any, are necessary or advisable in these standards an extensive cooperative survey of the screw-thread industry has been carried out. Nearly 8,000 representative samples of bolts, nuts, and threaded studs collected from 128 representative manufacturers and users of screw threads were measured at the bureau and the detailed measurements tabulated and analyzed. The results of the survey will be published by the sectional committee composed of representatives of the several cooperating agencies.

**Thermal Expansion.**—Forty-one series of determinations were made on structural alloys and materials used in the arts. Nine firms have been given assistance in installing proper equipment for measuring thermal expansion. A satisfactory automatic, autographic expansion equipment has been designed and built which will be of service in many industrial laboratories desiring detailed records of the thermal expansion of materials used in their products.

**Capacities of Horizontal Cylindrical Tanks.**—During the year many tables have been prepared, by request, giving the capacity in gallons for each inch in height of liquid in horizontal cylindrical tanks of various diameters and lengths, such as are used for the storage of oil, gasoline, and other liquids. It is expected that these tables will be supplemented and published in order that they may become more generally available.

**Extension of Petroleum Oil Tables.**—Following the publication some years ago of Circular No. 154 and its supplement, there have been many requests for an extension of the tables contained therein to cover oils heavier than 10° A.P.I. The necessary oil samples have now been obtained and this work will be undertaken in the near future.

**Preparation of Ethyl Alcohol Tables.**—At the request of the Treasury Department certain tables of the Gauger's Manual have been recalculated on the basis of the results obtained some years ago in an extensive investigation carried out at this bureau on the density and thermal expansion of ethyl alcohol and its mixtures with water.



**Cooperation with the States.**—Formal State conferences on weights and measures were attended in Illinois, Massachusetts, Michigan, New Jersey, New York, Ohio, and Pennsylvania (two), and informal conferences were held with State officers in Connecticut, Indiana, and Wisconsin. Information was furnished to one State and to several cities on the establishment of weights and measures departments, and advice was given to numerous existing officials on a variety of questions of administration. The preparation of a digest of weights and measures court decisions was continued.

## VII. COUNTY AND STATE PURCHASING AGENCIES

In the Standards Yearbook for 1927 there was given a certain amount of information relating to the purchasing methods of municipal and State governments. In later issues of the Yearbook additional information concerning the purchasing methods of these agencies has been included, together with brief references to the methods utilized by the purchasing agents of a few typical counties. In the present chapter there is presented some up-to-date information concerning several hundred counties throughout the whole country, and a summary of the standardizing and purchasing methods used by the State purchasing agencies and the State highway commissioners.

### COUNTY PURCHASING AGENCIES

While the majority of States and over 200 cities of the United States employ purchasing methods which favorably compare with the best modern practices of private business, the governments of the 3,072 counties of the country, aside from notable exceptions, adhere to procurement methods which are many years old.

Although each county is free within certain limits to determine how it shall conduct its own business transactions, county government is regulated by State law in practically all States, and county purchasing offices are for the most part established under general permissive statutes. We find, for example, that the general law of New York is supplemented by special laws which prescribe a definite purchasing organization for each of certain counties. A county in Oklahoma reports that the last State legislature there placed the purchasing power upon each officer and holds him fully responsible for his expenditures. In certain counties of Minnesota, Indiana, and other States centralized purchasing has been established bit by bit in the form of special laws.

If we add to such purchasing variations already named those which inherently flow from county governments widely divergent in character and needs, it is at once clear why there are such marked differences displayed in the procurement methods even in adjoining counties of the same State.

In order to secure as much data as possible upon county purchasing, and to bring up to date its earlier published material on the subject, the Bureau of Standards recently requested the treasurers of the more than 3,000 counties to furnish the names and titles of the officials responsible for making purchases in their respective counties. Examination of the 1,700 replies received from as many different counties of the United States conclusively indicates the marked predominance of a decentralized system of purchasing in county government.

When the treasurers indicated that there was more or less centralization in purchasing, a questionnaire relative to county procurement methods was addressed to the individual holding the office of, or equivalent to that of, purchasing agent. Replies were received from 422 counties, representing every State in the Union but Delaware, Nevada, New Hampshire, and Rhode Island.

The survey shows that frequently the list of county purchasers is as long as the list of county officials, and more often than not the official buys without written specifications, adequate test, or careful planning. In many counties the official board, functioning as a unit, at times independently but generally in conjunction with the county engineer and school superintendent, is reported as procuring the necessary supplies and equipment for the county. Often the board authorizes the heads of departments and institutions to make ordinary purchases for their respective units. More frequently, however, the board assigns to one of its own members, or other county official, such as the county clerk, the county auditor, or the county recorder, the task of buying on a part-time basis in connection with his regular work.

Delegation of authority by the board, especially in populous counties where the material wants are extensive, occasionally takes the form of a purchasing committee or a regularly organized purchasing bureau. Purchases in the counties of a few States are made by or under the authority of the county judge; while in other counties purchasing is done by the various county officials under the authority of the county court, which usually consists of three judges. Subdivisions corresponding to counties in other States are called parishes in Louisiana, the buying for which is generally done by or under the authority of the police juries.

Centralized purchasing, generally defined as the delegation to a single office of the authority to purchase supplies, materials, and equipment needed for use by all the several branches of government, occurs in very few counties of the United States, probably not more than 100, largely in California, North Carolina, and New York. Many examples of centralized county purchasing are to be found in California, where the State has passed laws permitting its counties to adopt the county-manager plan of government and to establish centralized purchasing. Questionnaires returned from this State show that at least 13 of its 57 counties have centralized purchasing departments, all but 2 of which purchase for every office of the county.

Practically all counties employing a centralized purchasing system appear to maintain a complete and efficient organization for buying, often comparable to that found in representative industries. The purchasing agent buys all supplies (schools and other institutions excepted in some counties, but not all), generally according to specification and after consultation with the using departments. Further, county laboratories are maintained or commercial or university laboratories made use of for testing purposes. The survey shows that pronounced savings are often effected through the adoption of such centralized purchasing.

The county-manager plan of operation mentioned in connection with California has also been adopted in Albemarle, Arlington, and



Washington Counties, Va. A modification of this plan, possessing many of its essential features, has been in use in Alamance, Cleveland, Davidson, Guilford, and Robeson Counties, N. C.; and in Augusta, Fairfax, and Pittsylvania Counties, Va. Proposed changes in county governments, usually involving the introduction of the county-manager plan, have been given consideration in Alabama, Colorado, Florida, Georgia, Indiana, Iowa, Kansas, Mississippi, Missouri, North Dakota, Ohio, Oklahoma, Oregon, and South Carolina. In California, Iowa, Maine, Maryland, Montana, New Hampshire, New Mexico, North Carolina, North Dakota, Oklahoma, South Dakota, Virginia, and Wyoming the State constitutions permit the counties to adopt such a form of government as the county-manager plan, whereas in other States enabling acts by the legislatures would be required.

If the definition of centralized purchasing already given is modified so as to read "the delegation to a single office of the authority to purchase supplies, materials, and equipment needed for use by all the several branches of government, except highways, schools, hospitals, and eleemosynary institutions," the counties reporting such a system, plus those having fully centralized purchasing, will be found in practically every State of the Union, and will exceed 300.

Purchasing in the county actually begins when the using agency notifies the buying agency of its needs. While such notification may and probably often does take the form of a mere verbal request, the orthodox way is through the written requisition. After the requisition has been approved, naturally the next thing is to let the public know what material or service is required. This is done in various ways—most commonly through the direct request for quotations. While all purchases involving an expenditure of several hundred dollars must generally be submitted to bid, purchases of a lesser value are often handled directly by the board or other authorized county official. The ultimate responsibility for approving invoices for payment in counties is usually a function of the county board.

Obviously, in order to make an intelligent bid, the bidder should be fully informed as to what he will be expected to furnish. Such details are generally predicated upon certain standards established by Federal, State, and local governments, and by various societies and associations. Of course, all commodities used by a government can not be standardized, but many can be and are, with a resultant reduction in cost and an improved delivery service for the purchaser.

It is a significant fact that approximately 75 per cent of the 422 counties replying to the questionnaire reported the use of specifications. In more than 34 per cent of the counties either the county engineer, highway commissioner, or superintendent of road construction, as his title may be, drafts the specifications, chiefly for roads, bridges, sea walls, and other similar construction work. The specifications are generally subject to the approval of the county administrative body. In many counties purchases for the highway department are procured under State highway department specifications.

Purchasing agents prepare specifications for general supplies and equipment in 23 per cent of the counties reporting. The county board, or officials designated by it, drafts the required specifications

in 17 per cent of the reporting counties. In a number of counties specifications are drafted by the various department heads and in others by technical officers consulting the using department. Frequently the combined efforts of the county engineer, county chemist, attorney, purchasing agent, and user are employed. In some counties various qualified experts are used in drawing specifications for particular lines. More than 22 per cent of the reporting counties consult the using departments of the government concerning their specification needs.

Approximately 46 per cent of the 422 counties furnishing data purchase on standard specifications of national technical societies and trade associations, 32 per cent on specifications prepared by their own government, 17 per cent on Federal Government specifications, and 16 per cent on trade brands. It should, of course, be borne in mind that certain counties indicated the use of two, three, or even all of the methods referred to, depending upon the nature of the commodity procured.

Comparatively few counties of the United States reported the maintenance by their own government of laboratories for testing, or the employment of commercial, university, or other laboratories for such purposes. Of the 149 counties, representing 34 States, reporting the use of laboratories for testing commodities purchased by the county, 4 use their own county laboratory; 83 use university or college laboratories; 46, their State laboratory; and 10, other laboratories. One, Riverside County, Calif., uses commercial, State, and local laboratories. Eleven use commercial and university laboratories; 10, State and university laboratories; 7, State and commercial laboratories; 7, university and other laboratories; 2, commercial, university, and other laboratories; and 1, Federal, State, commercial, and university laboratories.

Although deliveries to counties are usually examined by more or less rule-of-thumb methods, leaving much to be desired, there are many exceptions. It was found that 126 reporting counties employ inspectors of one kind or another, many of whom are reported to be highly trained. Of course, the purchases made by some counties are not large enough to justify the employment of skilled inspectors. In such cases the various receiving agencies examine and pass upon incoming supplies.

Only 20 counties reported the use of performance tests, and most of these were counties with a centralized purchasing system. An occasional county with a decentralized system reported the use of trained inspectors and tests. At least 14 of the counties of California resort to inspection and tests in their purchasing.

While the list of progressive county organizations making use of centralized purchasing as a means of effective service to the residents and taxpayers of the county is not a long one, it is quite impressive so far as savings made over decentralized methods is concerned. Reported savings from 53 counties of 22 States range anywhere from 5 to 50 per cent, with the average for the group at about 22 per cent. Quite a number of counties reported a saving of 25 per cent or greater on the purchase of their school supplies through centralized buying.



Naturally, there are limits to the feasibility and efficiency of a completely centralized purchasing system in sparsely settled counties. For them it might well be an expensive luxury, except in the purchase of the more commonly used materials. The solution to their problem may lie in county consolidation, already considered by 64 counties of 20 States, or in cooperative purchasing, whereby two or more adjacent counties would pool their needs and purchase on joint contracts.

#### STATE PURCHASING AGENCIES

In an endeavor to augment and bring up to date its earlier published material on State purchasing, the Bureau of Standards recently sent questionnaires to the procurement agencies (State and State highway) of the 48 States, and the District of Columbia. An abstract of the data gained from the returns—43 out of 49 State questionnaires (includes the District of Columbia) and 47 out of 48 State highway questionnaires—together with pertinent information from other sources, is presented in the following pages.

Perhaps the most definite fact brought out by the bureau's survey is the wide prevalence of centralized State purchasing. This system, given its initial trial in State government in 1897, when Iowa centralized its purchases for penal and charitable institutions, languished until 1910, the year Oklahoma became the first State to centralize the buying for all branches of its government. Since then the centralized purchasing movement has increased apace, and to-day questionnaire returns show that at least 31 States, and the District of Columbia, are using such a system with varying degrees of inclusiveness.

Centralized State purchasing bodies have a variety of names, but they may be grouped for the most part under three general types of administration. The first type contains those States which buy through a separate purchasing department or bureau, such as Arkansas, Idaho, Illinois, Maine, Massachusetts, Montana, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Virginia, Wisconsin, and the District of Columbia. The second type purchases through an appointive board, and includes Alabama, Arizona, Florida, Kentucky, Michigan, North Dakota, Oregon, Texas, Utah, and Wyoming. The third type includes at least eight other States—California, Maryland, Minnesota, Ohio, South Dakota, Tennessee, Vermont, and Washington—which procure supplies through a subdivision of the State finance department.

In contrast to those States that employ a centralized purchasing system, there are as many as six States in which the several departments of the government make their own purchases—Connecticut, Delaware, Louisiana, Mississippi, Nevada, and New Mexico. Although centralized purchasing is employed for penal, correctional, charitable, or other individual governmental divisions of Indiana, Iowa, Georgia, Kansas, Missouri, Nebraska, Rhode Island, and West Virginia, no centralized purchasing agency is reported for all divisions of any of these States.

Needless to say, no State purchasing agency buys everything required by the entire State government, for emergencies arise which



permit no delay in securing supplies, materials, or equipment. In some States perishable foodstuffs and fuel are purchased directly by the superintendents, business managers, or stewards of the several State institutions; in others, books for the State educational institutions are purchased independently. Technical apparatus and equipment are exempted from central purchase in several States.

Aside from independent emergency procurement by department officials of State governments, however, there are 16 States—Arkansas, Florida, Illinois, Massachusetts, Minnesota, Montana, New York, North Carolina, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Vermont, Washington, and Wisconsin—which report that their central purchasing body buys for all divisions of the government, including State highway and State educational institutions. Four States—Arizona, Maine, Michigan, and Wyoming—report that their respective central purchasing agencies buy for all divisions of the State government, except State highways and State educational institutions.

Obviously, the principal function of these purchasing bodies is to carry through to completion all entrusted procurement negotiations. To do this efficiently and economically requires systematization and the elimination of all obsolete purchasing machinery. Many States have gone a long way in this direction through centralized procurement, the use of specifications, laboratories, skilled inspectors, and performance tests. The extent to which such methods are employed is shown in the following table:

*State purchasing methods, 1932*

[Not including highways]

(X = Yes)

State	Specifications drafted by—			Purchase on specifications of—				Employ laboratories				Use inspection and tests	Percentage of savings effected through centralization
	Purchasing agent	Heads of departments	Using departments consulted	Own government	Federal Government	National technical societies and trade associations	Trade brands	Own	College	State highway	Commercial		
Alabama.....		X	X	X	X	X	X	X	X	X	No.	X	(1)
Arizona.....			X		X	X	X	X	X	X	X	X	(1)
Arkansas.....	X		X	X	X	No.	No.	X	X	X	X	(2)	25
California.....	X			X	X	X	X	X	X	X	No.	(2)	
Colorado <sup>3</sup> .....				No.	No.	No.	X	No.	X			(2)	
Connecticut.....	X		X					No.	X	X	X	(2)	
Delaware.....		X							No.				
District of Columbia.....	X		X	X	X	X	X		No.			(4)	10-15
Florida.....	X		X			No.	X					(4)	
Georgia <sup>3</sup> .....	X		X	X	No.	X	X	X				X	
Idaho.....	X		X	X			X					(2)	22-27
Illinois.....	X		X	X	X		No.		X	X		X	
Indiana.....			X	X	X	X	X	No.	X			(2)	(1)
Iowa.....	X		X	X			No.	X	X		X	X	
Kansas <sup>3</sup> .....					X			X	X			X	

<sup>1</sup> Savings considerable, but percentage not available.

<sup>2</sup> Make performance tests.

<sup>3</sup> 1930 data given, latest available for Colorado, Georgia, and Utah; 1929 data, latest available for Kansas and Oklahoma; 1927 data, latest available for Mississippi. No data for Virginia.

<sup>4</sup> Employ trained inspectors.

## State purchasing methods, 1932—Continued

[Not including highways]

(X = Yes)

State	Specifications drafted by—			Purchase on specifications of—				Employ laboratories				Use inspection and tests	Percentage of savings affected through centralization
	Purchasing agent	Heads of departments	Using departments consulted	Own government	Federal Government	National technical societies and trade associations	Trade brands	Own	College	State highway	Commercial		
Kentucky			No.	X	X	X	X	No.	X			X	25-30
Louisiana					X	X		X	No.				10-20
Maine				X	X		X	No.	X			X	10
Maryland	X		X	X	X			No.	X		X	(1)	5.9
Massachusetts	X	X	X	X	X	X	No.	X	X				
Michigan		X	X	X	X		No.		X	X	X	(2)	10
Minnesota			X					X	X			(2)	40
Mississippi <sup>1</sup>								No.	No.				
Missouri	X		X	X			X	X	X	X		(1)	
Montana	X		X	X	X		X	No.	X			(2)	
Nebraska			X	X			X	X	X		No.	No.	8-15
Nevada <sup>2</sup>													
New Hampshire	X		No.	No.	X						X	(2)	(1)
New Jersey			X	X	X	No.	No.	X	X		X	(4)	40
New Mexico	X		X						X				
New York	X		X	X	X	X	No.	X	X			(1)	20-30
North Carolina	X		X	X	X	X		X	X	X	X	X	
North Dakota	X		No.	X			No.	X	X				
Ohio	X		X	X			X	No.			X	(2)	15-20
Oklahoma <sup>3</sup>					No.	No.		No.	No.				
Oregon			X	X	X	X	X		X			X	20
Pennsylvania			X	X	X	X	No.	X	No.		X	(2)	(1)
Rhode Island	X		X	X	X		No.		X		X	X	15
South Carolina													
South Dakota			X	X				No.	X		No.	X	(1)
Tennessee			X	X	No.		X	X	No.		No.	X	
Texas			X		X			No.	X				
Utah <sup>4</sup>	X		X		X	X		No.	X			(2)	7½
Vermont	X		X		X	No.		X	No.		No.	(2)	(1)
Virginia <sup>5</sup>													
Washington	X			X	X	X	X		X	X		X	
West Virginia	X							No.	X				
Wisconsin	X			X	X			X	X	X		X	25-50
Wyoming		X	X	No.	X		X	No.	No.				25-30
Total, yes (X)	23	5	31	28	26	14	19	18	30	12	11	35	
Total, no.....	0	0	3	3	4	6	10	15	9	0	6	1	

<sup>1</sup> Savings considerable, but percentage not available.<sup>2</sup> Make performance tests.<sup>3</sup> 1930 data given, latest available for Colorado, Georgia, and Utah; 1929 data, latest available for Kansas and Oklahoma; 1927 data, latest available for Mississippi. No data for Virginia.<sup>4</sup> Employ trained inspectors.<sup>5</sup> No specifications used.

Examination of the preceding table shows that at least 42 of the 48 States, together with the District of Columbia, use specifications. In addition to those States which name the purchasing agent or the heads of various departments as chiefly instrumental in drafting specifications, several report that their specifications are formulated by the State purchasing bureau, the State standards committee, or the State specifications division. Not a few States utilize

the combined services of their State engineer and other technical authorities in drafting specifications.

In the formulation, adoption, and modification of specifications the purchasing agencies of 31 States report that they seek the advice and cooperation of the State departments or agencies concerned in order to ascertain their precise requirements. Only Kentucky, New Hampshire, and North Dakota report that their using departments are not consulted.

It is interesting to note that many States which purchase according to their own government specifications report the use of Federal Government specifications or specifications of national technical associations as the basis for their own specifications. Some of the most frequently mentioned specifications relied upon are those of the Federal Specifications Board, the American Society for Testing Materials, Society of Automotive Engineers, and the United States Navy.

Although deliveries to certain State purchasing agencies receive very casual inspection and frequently no test at all, 39 States report the use of laboratories for testing deliveries, and 35 the use of inspectors and various tests. In some cases the receiving agents of the different using departments alone examine and pass upon incoming supplies.

Eighteen States report a savings effected by centralized purchasing ranging from 6 to 50 per cent. Seven other States, unable to quote exact savings, declare they are considerable. The average saving is about 21 per cent. With the exception of three States, the savings in every instance amounted to 10 per cent or better. Eleven States reported a saving of 20 per cent or better; and two, a 40 per cent saving.

Turning now to State highway purchasing, it is observed that during the past 30 years the business of building roads and furnishing highway service has changed from a matter of community effort to one of county, State, and Federal activity. It has grown to such gigantic stature that the total disbursements by and for State highway departments for 1931 were reported as in excess of \$1,000,000,000. Expenditures for maintenance alone amounted to nearly \$161,000,000, to say nothing of more than \$21,000,000 spent for equipment and machinery.

The problem of constructing and maintaining the nation-wide system of highways has been entrusted by the several States to their highway departments and commissions. In at least 25 States supplies, materials, and equipment for State highways are bought through the State highway departments and commissions; and in 12 States through State purchasing agents. The following tabulation of State highway purchasing methods shows which States buy on specification, which employ laboratories, and which make inspection and test of purchases.



## State highway purchasing methods, 1932

(X = Yes)

State	Purchase on specifications of—				Employ laboratories			Use inspection and tests
	Own government	Federal Government	National technical societies and trade associations	Trade brands	Own	College	Commercial	
Alabama.....	X		X	No.	X	No.	No.	X
Arizona.....	X	X	X		X		No.	(1)
Arkansas.....		X	X			No.	X	(1)
California.....	X		X		X	X	X	X
Colorado.....	X	X	X	X	No.	X	No.	X
Connecticut.....	X	X	X		X	X	X	X
Delaware.....	X	X	X	X	X		X	(2)
Florida.....			X	No.	X		X	
Georgia.....	X	X	X		X		X	(2)
Idaho.....	X	No.	X	X	X	X	X	(1)
Illinois.....	X	X	X	No.	X			(1)
Indiana.....	X	X	X		X			(2)
Iowa.....	X		X		X		X	
Kansas.....	X	X	X	X			X	(2)
Kentucky.....	X	X	X		X	X	X	(2)
Louisiana.....	X	No.	X	No.	X	X	X	(2)
Maine.....	X	No.	X	No.	X	X	X	X
Maryland.....	X	No.	X	X	X	X	X	(2)
Massachusetts.....	X	X	X	No.	X	X	X	(2)
Michigan.....	X		X	No.	X	X	X	(1)
Minnesota.....	X	X	X	X		X	X	(1)
Mississippi <sup>1</sup> .....	X	No.	X	No.	No.		X	X
Missouri.....	X		X	No.		No.	X	X
Montana.....	X	X	X		X	X	X	X
Nebraska.....	X	No.	X	X	X	X	X	(1)
Nevada.....	X	X	X	No.	X	X	X	(1)
New Hampshire.....	X	X	X	No.		No.	X	(2)
New Jersey.....	X	X	X	X	X	X		(2)
New Mexico.....	X	No.	No.	X			No.	(2)
New York.....	X	X	X	No.	X	No.	X	(1)
North Carolina.....		X	X	No.	X	X	X	(2)
North Dakota.....	X	X	X	X	X	No.	X	(1)
Ohio.....	X	No.	X	X	X	X	No.	(2)
Oklahoma.....	X	X	X	X	X		X	
Oregon.....	X	No.	X	X	X	X	No.	(1)
Pennsylvania.....	X	X		X	X	No.	No.	X
Rhode Island.....	X	X	X	X	X	X	X	(1)
South Carolina.....	X	X	X	X	X	X	X	
South Dakota.....	X	X	X	X	X	X		(2)
Tennessee.....	X	No.	X		X	No.	No.	X
Texas.....	X	X	X	X	X	X	X	(2)
Utah.....	X	No.	X		X	X	No.	(2)
Vermont.....	X	X	X	X	X	X	X	(2)
Virginia.....	X	X	No.	No.	X	No.	X	X
Washington.....	X	X	X	X	X	No.	X	(2)
West Virginia.....	X		X	No.	X	X	X	(2)
Wisconsin.....	X	X	X	X	X	X	X	(2)
Wyoming.....	X	X	No.	X	X	No.	X	(2)
Total yes (X).....	45	30	43	22	45	26	36	46
Total no.....	0	11	3	15	2	11	9	0

<sup>1</sup> Make performance tests.<sup>2</sup> Employ trained inspectors.

1930 data given, latest available.

From the foregoing table it is seen that all of the 48 State highway departments use specifications. Almost without exception they are drawn by the State engineer and/or assistants, or by each division with the approval of the chief engineer. In Connecticut, for example, highway specifications are formulated by the deputy highway commissioners, designing engineers, and testing engineers. Specifications for Maryland highways are made by the engineering departments; for Massachusetts, by the department of public works, under the direction of the chief engineer; and for Texas, by the engineers, chemists, or purchasing officer.

It is a significant fact that of the 48 State highway departments which employ laboratories in connection with their purchase routine, 45 of them have their own laboratories. Many of these are completely equipped for making all necessary chemical and physical tests of materials purchased. Others, not so fully equipped, utilize the services of commercial or university laboratories. In several cases the State highway department maintains a laboratory in cooperation with the State college or university, the various testing appliances being used by both organizations.

The amount of inspection and testing necessary for road materials has naturally increased steadily with the growing emphasis placed upon highway construction. The increase in one State alone—Maine—is well illustrated by a comparison of the number of tests made of Portland cement. It is reported that whereas in 1914 only 7 samples were tested, in 1931 more than 300 samples were tested. And Maine is by no means the only State in which the highway department inspects and tests its purchases. Forty-six other States do likewise.

Finally, with respect to highways, it seems pertinent to give renewed attention to the fact that modern conditions are apparently demanding a reallocation of governmental functions so as to provide larger administrative units. To this end, certain States have been taking over, reconstructing, and maintaining all roads within their confines. And in several States, notably, Iowa, Kansas, and Michigan, the State governments have been authorized to assist in constructing and maintaining the roads in cities, counties, and townships which are designated as connecting links in the State road systems.

#### ALPHABETICAL LIST OF STATE PURCHASING AGENCIES

In the following brief items there are set forth the names of the State purchasing agencies, including State highway departments, together with the titles and addresses of the chief officers concerned with the preparation of specifications and the purchase of materials, supplies, and equipment.

##### Alabama:

- State Board of Administration, *purchasing agent*, Montgomery.
- State Highway Department, *highway director*, Montgomery.

##### Arizona:

- Board of Directors of State Institutions, *State purchasing agent*, Phoenix.
- State Highway Department, *purchasing agent*, Phoenix.

##### Arkansas:

- State Highway Commission, *State highway engineer*, Little Rock.
- State Purchasing Department, *State purchasing agent*, Little Rock.

## California:

State Department of Finance, Bureau of Purchases, *State purchasing agent*, Sacramento.

State Highway Department, *State highway engineer*, Sacramento.

## Colorado:

State Educational Institutions, Associated Purchasing Agents of, *chairman*, Boulder.

State Highway Department, *State highway engineer*, Denver.

## Connecticut:

State Board of Finance and Control, *commissioner*, Hartford.

State Highway Department, *purchasing officer*, Hartford.

## Delaware:

General Assembly, *secretary of state*, Dover.

State Highway Department, *chief engineer*, Dover.

District of Columbia, purchasing office, *purchasing officer*, Washington, D. C.

## Florida:

Board of Commissioners of State Institutions, purchasing department, *manager*, Tallahassee.

State Road Department, *chief engineer*, Tallahassee.

## Georgia:

State Department of Public Printing, *State purchasing agent*, Atlanta.

State Highway Department, *State highway engineer*, Atlanta.

## Idaho:

State Bureau of Supplies, *State purchasing agent*, Boise.

State Department of Public Works, *commissioner of public works*, Boise.

## Illinois:

State Department of Public Works and Buildings, Division of Highways, *chief highway engineer*, Springfield.

State Division of Purchases and Supplies, *State purchasing agent*, Springfield.

## Indiana:

State Highway Commission, *purchasing agent*, Indianapolis.

State Joint Purchasing Committee, *secretary*, Indianapolis.

## Iowa:

Board of Control of State Institutions, *purchasing agent*, Des Moines.

State Highway Commission, *chief engineer*, Ames.

## Kansas:

State Board of Administration, *State business manager*, Topeka.

State Highway Commission, *purchasing agent*, Topeka.

## Kentucky:

State Highway Commission, *chairman of commission*, Frankfort.

State Purchasing Commission, *State purchasing agent*, Frankfort.

## Louisiana:

State Board of Commissioners of the Port of New Orleans, *general manager*, New Orleans.

State Highway Commission, *State highway engineer*, Baton Rouge.

## Maine:

Bureau of Purchases, *State purchasing agent*, Augusta.

State Highway Commission, *chief engineer*, Augusta.

## Maryland:

State Central Purchasing Bureau, *State purchasing agent*, Baltimore.

State Roads Commission, *purchasing agent*, Baltimore.

## Massachusetts:

State Department of Public Works, *chief engineer*, Boston.

State Purchasing Bureau, *State purchasing agent*, Boston.

## Michigan:

State Administrative Board, *buyer*, Lansing.

State Highway Department, *chief engineer*, Lansing.

## Minnesota:

Commission of Administration and Finance, *commissioner of purchases*, St. Paul.

State Department of Highways, *commissioner of highways*, St. Paul.

State Department of Public Institutions, *purchasing agent*, St. Paul.

## Mississippi:

State Board of Public Contracts, *secretary of state*, Jackson.

State Highway Department, *chairman*, Jackson.



## Missouri:

- State Highway Commission, *chief engineer*, Jefferson City.
- State Purchasing Agencies, *State auditor*, Jefferson City.

## Montana:

- State Highway Commission, *State highway engineer*, Helena.
- State Purchasing Department, *State purchasing agent*, Helena.

## Nebraska:

- State Board of Control, *secretary*, Lincoln.
- State Department of Public Works, Bureau of Roads and Bridges, *State engineer*, Lincoln.

## Nevada:

- State Board of Capitol Commissioners, *chairman*, Carson City.
- State Department of Highways, *State highway engineer*, Carson City.

## New Hampshire:

- State Highway Department, *commissioner of highways*, Concord.
- State Purchasing Department, *State purchasing agent*, Concord.

## New Jersey:

- State Highway Commission, *purchasing clerk*, Trenton.
- State Purchasing Department, *State purchase commissioner*, Trenton.

## New Mexico:

- State Highway Department, *purchasing director*, Santa Fe.
- State Officials, *State auditor*, Santa Fe.

## New York:

- Department of Public Works, Division of Highways, *commissioner of highways*, Albany.
- State Division of Standards and Purchase, *superintendent of standards and purchase*, Albany.

## North Carolina:

- Division of Purchase and Contract, *director*, Raleigh.
- State Highway Commission, *purchasing agent*, Raleigh.

## North Dakota:

- Board of Administration, Purchasing Department, *State purchasing agent*, Bismarck.
- State Highway Commission, *chief engineer*, Bismarck.

## Ohio:

- State Department of Finance, *purchasing agent*, Columbus.
- State Department of Highways, *purchasing agent*, Columbus.

## Oklahoma:

- State Board of Public Affairs, *chairman*, Oklahoma City.
- State Highway Commission, *purchasing agent*, Oklahoma City.

## Oregon:

- State Highway Commission, *State highway engineer*, Salem.
- State Purchasing Board, *State purchasing agent*, Salem.

## Pennsylvania:

- Department of Highways, *director of standards and purchases*, Harrisburg.
- Department of Property and Supplies, Bureau of Standards and Purchases, *director of standards and purchases*, Harrisburg.

## Rhode Island:

- State Board of Public Roads, *chief engineer*, Providence.
- State Public Welfare Commission, Purchasing Department, *purchasing agent*, Howard.

## South Carolina:

- State Highway Department, *State highway engineer*, Columbia.
- State Joint Committee on Printing, *secretary*, Columbia.

## South Dakota:

- State Department of Finance, Division of Purchasing and Printing, *director of purchasing and printing*, Pierre.
- State Highway Commission, *State highway engineer*, Pierre.

## Tennessee:

- State Department of Highways and Public Works, *State highway engineer*, Nashville.
- State Department of Purchasing, *State purchasing agent*, Nashville.

## Texas:

- State Board of Control, Division of Purchasing, *secretary*, Austin.
- State Highway Commission, *State highway engineer*, Austin.

## Utah:

State Board of Supplies and Purchase, *purchasing agent*, Salt Lake City.  
State Road Commission, *chief engineer*, Salt Lake City.

## Vermont:

State Department of Purchasing, *purchasing agent*, Montpelier.  
Department of Highways, *chief engineer*, Montpelier.

## Virginia:

State Department of Highways, *purchasing agent*, Richmond.  
State Purchasing Commission, *purchasing agent*, Richmond.

## Washington:

Department of Business Control, Division of Purchasing, *supervisor of purchasing*, Olympia.  
Department of Highways, *director of highways*, Olympia.

## West Virginia:

State Board of Control, purchasing department, *purchasing agent*, Charleston.  
State Road Commission, *purchasing agent*, Charleston.

## Wisconsin:

State Bureau of Purchases, *director of purchases*, Madison.  
State Highway Commission, *State highway engineer*, Madison.

## Wyoming:

State Board of Supplies, *chairman*, Cheyenne.  
State Highway Department, *State highway engineer*, Cheyenne.

## VIII. GENERAL STANDARDIZING AGENCIES IN THE UNITED STATES

Among the many technical societies and trade associations in the United States which conduct standardization and simplification work along with their other activities, there are four organizations which make standardization or work closely related thereto, the major feature of their activities, namely, the American Standards Association, the American Marine Standards Committee, the American Society for Testing Materials, and the Central Committee on Lumber Standards. These four agencies are actively engaged in the formulation of standards, specifications, codes, and methods of tests, and they cooperate with many technical trade associations and governmental bodies.

Outlines of the standardization activities of these organizations are given in the present chapter, with special reference to their accomplishments during the past year.

Additional information concerning the functions and procedures of their committees engaged in the preparation of standards and specifications are to be found in previous editions of the Standards Yearbook.

### AMERICAN STANDARDS ASSOCIATION

The American Standards Association (ASA) is the recognized medium through which American industry functions in setting up for itself nationally acceptable standards. In essence it is a federation of 39 national technical societies, trade associations, and Federal Government departments, and it brings together all those directly concerned with a project, and organizes a technical committee composed of official delegates of all important bodies directly interested, to formulate the standard; and finally, when such a committee has prepared or selected the standard and given it substantially unanimous approval, and the American Standards Association is definitely assured that the standard represents a real national consensus, to make it an "American standard."

At present more than 2,700 officially accredited representatives from every branch of industry—approximately 474 national associations, governmental departments, and trade or industrial groups, and about 100 companies—are participating actively in the association's work.

The association's offices are at 29 West Thirty-ninth Street, New York, N. Y. Dr. P. G. Agnew is the secretary. The actual setting up of standards is done by technical committees representing the producing, distributing, and consuming groups concerned with the projects. It is a basic requirement of ASA procedure that no standards shall be approved unless all important interests have been represented in developing them, thus avoiding the domination of any



one interest, except when the consent of other groups has been granted.

Nationally acceptable standards have been prepared under the auspices of the ASA in practically every major field of industrial activity, or are now under way. In addition to providing a suitable medium for the establishment of nationally acceptable standards, the ASA serves as a clearing house for information on standardization work both in the United States and abroad. It also acts as the authoritative channel in international cooperation in standardization activities.

Since the latter part of 1929 the ASA has been a member of the International Federation of Standardizing Associations (ISA), the organization through which cooperation in the development of international industrial standards is secured. The ISA has its headquarters at Basel, Switzerland, and its membership includes 18 national standardizing bodies. (See p. 13.)

Every year the ASA handles a large number of requests for technical information on standardization. In answering these requests the office not only makes available the material in its files, but also collects information from numerous trade and technical organizations in the United States and abroad.

The monthly publication of the American Standards Association, formerly known as the ASA Bulletin and now called Industrial Standardization, goes to all sustaining members as a part of the service rendered in connection with membership. The publication is also available to individuals on a subscription basis.

Up to September 1, 1932, 211 standardization projects had been approved by the American Standards Association. There are 149 additional uncompleted projects which have an official status before the ASA.

The following is a list of the standards approved by the American Standards Association from September 1, 1931, to September 1, 1932:

*Civil engineering.*—Safety code for floor and wall openings, railings and toe boards; steel reinforcing bars.

*Mechanical engineering.*—Safety code for the protection of industrial workers in foundries; 800-pound hydraulic cast-iron pipe flanges and flanged fittings; code for testing domestic refrigerators using ice; plain and thread plug and ring gage blanks.

*Electrical engineering.*—Definitions and general standards for wires and cables; weatherproof (weather resisting) wires and cables; heat resisting wires and cables; standard vacuum-tube base and socket dimensions; manufacturing standards applying to broadcast receivers; rolled threads for screw shells of electric sockets and lamp bases; standard for electric railway control apparatus; recommended practice in the temperature operation of transformers.

*Mining.*—Methods of screen testing of ores (hand method); drainage of coal mines; safety rules of installing and using electrical equipment in metal mines.

*Miscellaneous.*—Letter symbols for mechanics, structural engineering and testing materials; safety code for the installation of pulverizing systems for sugar and cocoa; safety code for the prevention of dust explosions in starch factories; safety code for the prevention of dust explosions in terminal grain elevators; safety code for the prevention of dust explosions in wood flour manufacturing establishments; safety code for the prevention of dust ignition in spice-grinding plants; safety code for the use of inert gas for fire and explosion prevention; approval requirements for gas ranges.

New projects given an official status by or proposed to the American Standards Association from September 1, 1931, to September 1, 1932, include:

*Mechanical engineering.*—Classification and designation of surface qualities; inch-millimeter conversion for industrial use; shaft couplings; integrally forged flange type for hydroelectric units; foundry patterns of wood; work in compressed air.

*Electrical engineering.*—Shellac, synthetic resins, and other similar insulating materials.

*Miscellaneous.*—Carbon residue of petroleum products (Conradson carbon residue); testing gas oils (gravity, distillation, sulphur, carbon residue, pour point, viscosity, water); expressible oil and moisture in paraffin waxes; definitions of terms relating to petroleum; dilution of crank-case oils; precipitating number of lubricating oils; accoustical measurements and terminology; emergency lighting code; tests for nonshatterable glass; standards for motion pictures.

#### AMERICAN MARINE STANDARDS COMMITTEE

The American Marine Standards Committee (AMSC) is primarily a membership which fluctuates with changes in marine interests and personnel. As of July 1, 1932, it stood at 374 member bodies, widely distributed geographically. Office facilities, printing, and services are contributed by the Department of Commerce and the United States Shipping Board Merchant Fleet Corporation as a measure of cooperation with the organization. The administrative office is maintained in the Department of Commerce Building, Washington, D. C. A. V. Bouillon is the secretary.

The standardization work of this organization is carried on by technical committees on hull, engineering (machinery), ship operation, and port facilities. The chairmen of these committees are ex officio advisory members of the executive board. Coordination with the work of other standardizing bodies is effected and duplication of effort is avoided by interlocking contracts with technical societies and national associations whose fields embrace activities in any way related to ship or port construction and operation. There are standing special committees to decide questions which may arise among the users as to interpretation of the standards and to review and submit recommendations on proposals for international marine standards.

The results of the committee's technical work, generally designated as American Marine Standards, are published by the Department of Commerce and are distributed to the members of the AMSC and others directly interested. The publications are sold at nominal prices by the Superintendent of Documents, Government Printing Office. Up to July 1, 1932, 78 of these publications had been issued and 7 were in press or in preparation for printing. Four additional publications are listed for early compilation. A printed index to the group of publications numbered 1 to 75, inclusive, had also been issued. In the 89 publications printed or prepared for printing are included 96 hull standards, 36 engineering (machinery) standards, 27 ship operation standards, 7 port facilities standards, and 1 special standard. There are in course of development, or listed for early action, proposed standards for hinged water-tight doors and fittings; water-tight deck scuttles; hatch beam sockets; pipe flanges and flanged pipe fittings; marine plumbing fixtures; welding symbols, terms and definitions used in shipbuilding; and other items.



## AMERICAN SOCIETY FOR TESTING MATERIALS

The work of the American Society for Testing Materials (ASTM), a national technical society, involves the promotion of the knowledge of materials of engineering and the standardization of specifications and methods of testing. This is carried out through the activities of 55 technical committees having a combined membership of about 2,400, appointed to study the properties of engineering materials and to develop standards covering them. The work is done in two ways. The promotion of knowledge of engineering materials is effected through investigations into the properties of materials by committees and members of the society, and by joint researches with other groups, the results of which are presented at meetings as reports and papers which are discussed and published in annual proceedings. The standardization of specifications and methods of testing is carried on through the committees mentioned above.

The committees function under definite regulations, governing the personnel and methods of procedure. Each committee is made up of three main classes of membership—producers, consumers, and general interests. This latter class comprises independent authorities who have expert knowledge of the materials to be studied, but who are not concerned directly with either their production or use. Under the rules, the “producer” group may not predominate in any committee. By this procedure the producers and consumers of material are brought together on an equal footing, and the results of the work are thus satisfactory to both.

Membership in the society is held by individuals, companies, firms, corporations, industrial and trade associations, testing laboratories, Federal, State, and municipal departments, universities and technical schools, and technical societies and libraries. The total membership is about 4,200. Society headquarters are at 1315 Spruce Street, Philadelphia, Pa. C. L. Warwick is the secretary-treasurer.

Reports of the progress in the many activities sponsored by the society are made at each annual meeting in June. Each committee submits a report for the year at that time.

Contributions in the form of technical papers and discussions by leading investigators in scientific and technologic fields, including many important contributions from industrial researches, are presented before the society at the annual and other meetings. The following outstanding topics have been discussed at recent ASTM meetings: Nonmetallic protective coatings, discussion of tests of petroleum products, service tests of automotive products and correlation with laboratory tests, the manufacture of rubber products and the properties of rubber as an engineering material, textile materials, and steel castings.

In accordance with the policy of the society to expand its research and standardization activities, new standing committees on analysis of industrial waters and on spectrographic analysis have been organized. These have been given the designations, D-19 and E-2, respectively. Other committees are in process of organization.

The development of standards covering the following engineering materials and tests may be cited as among the current activities



of the society which are of outstanding importance: Steel castings, bolting flanges, and pipe for temperatures above 750° F.; seamless alloy-steel tubes and seamless carbon-steel tubes and pipe for gasoline cracking plants; wrought-iron rivets; heat treatment of gray cast iron; malleable iron castings for pipe fittings, valves, and valve parts; wrought alloys of aluminum and of magnesium; methods of crib and timber fire tests; refractory insulation; analysis of basic refractories; test methods of concrete permeability and for absorption; method of measuring unit weight and normal consistency of admixtures; test methods for durability of concrete; freezing-and-thawing tests of concrete; viscosity of electrical insulating oils; flash point of cut-back asphalts, etc.; antiknock rating of gasoline; fuel oils; Diesel fuels; Stoddard solvent; agglutinating properties of coal; friability of coal; woolen yarns, cloths, and felt; Holland cloth; automotive webbing; shoe tapes; asbestos roving; tests for sizing content in cotton tapes; cloth fraying test; membraneous cap sheets (waterproofing material); accelerated weathering tests for roofing; test for bituminous joint compounds; and weathering, thermal, and fatigue tests for building stone.

In the following table are shown the number of standards and tentative standards adopted in the year 1932 and the total number adopted to date, the standards being classified in accordance with the five main heads under which the society's standardization activities are conducted:

	Accepted in 1932			Total adopted to date	
	Standards	Tentative revisions of standards	Tentative standards	Standards	Tentative standards
A. Ferrous metals.....			19	103	36
B. Nonferrous metals.....		2	5	69	20
C. Cement, lime, gypsum, concrete, and clay products.....		1	4	62	31
D. Miscellaneous materials.....	1	3	18	197	126
E. Miscellaneous subjects.....			1	10	8
Total.....	1	6	47	441	224

The society adopted the following standards and tentative standards in 1932:

*A. Ferrous metals.*—Tentative specifications for lap-welded and seamless steel and lap-welded iron boiler tubes; electric-fusion-welded steel pipe; structural medium steel; structural rivet steel; cast-iron culvert pipe; ferrotungsten; low-carbon ferromolybdenum; molybdenum salts and compounds; gray-iron castings; zinc-coated (galvanized) iron or steel telephone and telegraph line wire; zinc-coated iron or steel tie wires; zinc-coated iron or steel farm-field and railroad right-of-way wire fencing; zinc-coated iron or steel chain-link fence fabric galvanized after weaving; zinc-coated iron or steel barb wire; zinc-coated iron or steel wire strand (cable); malleable iron castings.

Tentative method of test for magnetic properties of iron and steel; methods of chemical analysis of ferrotungsten and ferromolybdenum.

Recommended practice for safeguarding against embrittlement of hot-galvanized structural steel products and procedure for detecting embrittlement.

*B. Nonferrous metals.*—Standard specifications for round and grooved hard-drawn copper trolley wire; bronze trolley wire.

Tentative specifications for hard-drawn copper transmission cable; copper water tube; aluminum-copper-magnesium-manganese alloy bars, rods and shapes; magnesium-base alloy sheet; magnesium-base alloy wrought shapes (other than sheet); copper-base alloys in ingot form for sand castings; fire-refined copper other than lake; sand castings of the alloy—copper, 80 per cent; tin, 10 per cent; lead, 10 per cent.

*C. Lime, concrete, and clay products.*—Standard methods of testing cement.

Tentative specifications for clay sewer pipe; for masonry cement, including tests.

Tentative method of test for particle size of ground refractory materials; gypsum and gypsum products.

*D. Miscellaneous materials.*—Standard methods of test for distillation of natural gasoline; testing rubber products; methods of chemical analysis of rubber products.

Standard definitions of terms relating to materials for roads and pavements.

Tentative specifications for ethylene glycol mono butyl ether; ethylene glycol mono ethyl ether; acetate ester of ethylene glycol mono ethyl ether (90 to 91 per cent grade); acetate ester of ethylene glycol mono ethyl ether (95 to 96 per cent grade); insulated wire and cable; performance rubber compound; tolerances and test methods for tubular sleeving and braids; friction tape for general use for electrical purposes.

Tentative method of test for comparative hiding power of paints; methods of chemical analysis of calcium chloride; sampling coke for analysis; testing laminated tubes used in electrical insulation; test for grading natural mica according to size, commercial quality and thickness; sampling coal by ball-mill method; ductility of bituminous materials; residue of specified penetration; testing sheet and tape insulating materials for dielectric strength; varnished cloths and varnished cloth tapes used in electrical insulation; laminated round rods used in electrical insulation; flexible varnished tubing; pasted mica used in electrical insulation.

Tentative standard viscosity-temperature chart for liquid petroleum products. A tentative standard involving volume and specific gravity correction tables for creosote, creosote coal-tar solution (up to 50 per cent tar) and coal tar (coke-oven tars).

*E. Miscellaneous subjects.*—Tentative methods of Rockwell hardness testing of metallic materials.

**Cooperation with American Standards Association and Other National Organizations.**—As one of the five technical societies which united in the founding of the American Standards Association, the American Society for Testing Materials has been especially active in the work of the American Standards Association, to which it has submitted many of its standards for approval.

It is sponsor or joint sponsor for 16 ASA sectional committees and is represented on 25 other sectional committees. Fifty-eight ASTM standards have thus far been given ASA approval and consideration is being given to the approval of 17 others.

In addition to this cooperative work, it is the general policy of the society to cooperate with other organizations, either in standardization work or in research activities, wherever a common interest exists. The society has joined in a number of joint committees or councils, among which may be mentioned the following: Division of Engineering and Industrial Research of the National Research Council, American Bureau of Welding, Joint Committee on Investigation of the Effect of Phosphorus and Sulphur in Steel, Joint Committee on Standard Specifications for Concrete and Reinforced Concrete, and Conference Committee with ASME Boiler Code Committee.

Certain branches of the Government cooperate with the various standing committees of the society with which their work is closely allied. The Bureau of Mines, Bureau of Public Roads, Bureau of



Standards, Forest Products Laboratory, and others have done a great deal of work of valuable assistance in the development of many society standards.

**Marking of ASTM Apparatus.**—In a number of instances where committees of the society have developed specifications for testing apparatus, requirements have been included that the apparatus be marked in a manner identifying it with the society's standard. In such cases it is also required that the name or trade-mark of the manufacturers of such apparatus be marked thereon as a means of identifying the origin of the apparatus and placing the name of the manufacturer back of the statement implied by the appearance of the "ASTM" mark that the apparatus conforms to the society's standards.

**Certification Clause in Standards.**—In some few cases, the standards of the society include a so-called certification clause which states that "upon request of the buyer, the manufacturer shall be prepared to certify that his product conforms to the requirements of these specifications."

**Means of Encouraging and Facilitating the Use of Standards.**—For ease of reference the standards of the society are published in both separate form and collectively in a book of ASTM standards, issued triennially, with supplements in intervening years, and a book of ASTM tentative standards, issued annually. The bound publications are furnished with complete subject indexes, and the standards are listed under the headings of the materials covered and also by serial designation. In addition, the society issues an annual index to ASTM standards and tentative standards, which is a compilation, under appropriate key words of titles of all ASTM standards and tentative standards, together with the page and volume reference of the society publication in which they appear.

Special pamphlets containing the standards applying to a specific field are given widespread distribution. During the past year pamphlets on petroleum products and lubricants, refractories, electrical insulating materials, and textile materials have been published, and a book containing selected ASTM standards for engineering students has been adopted by many technical schools as one of the required textbooks. An idea of the distribution of ASTM standards can be gained from the fact that 8,000 copies of the 1930 book of ASTM standards were printed. In addition, it is not unusual for the society to distribute annually upwards of 50,000 reprints of the separate standards.

Many of the specifications of the society have been incorporated in general codes, such as the boiler code of the American Society of Mechanical Engineers, the building codes recommended by the National Board of Fire Underwriters, the United States Department of Commerce, many of the municipalities of the country, and in those prepared by various building officials' conferences.

#### CENTRAL COMMITTEE ON LUMBER STANDARDS

In cooperation with the United States Departments of Agriculture and Commerce, the Central Committee on Lumber Standards makes recommendations for the simplification of sizes, grades, no-



menclature, and trade practices in the lumber industry. The committee's findings are recognized as "American lumber standards" and published by the division of simplified practice of the Bureau of Standards.

The committee consists of 11 representatives of lumber manufacturers, wholesalers, retailers, and consumers. Its headquarters are at 1337 Connecticut Avenue NW., Washington, D. C. Arthur T. Upson is the secretary. Associated with the central committee are the Consulting Committee on Lumber Standards and the Hardwood Consulting Committee, both acting in an advisory capacity.

Thus far there have been published, in Simplified Practice Recommendation No. 16, lumber size and use classifications; nomenclature of commercial softwoods; definitions of defects and blemishes; lumber abbreviations; basis for measurement of lumber sizes; seasoning standards; basic grade names and qualities; rough and finished sizes; lengths; provisions covering description, measurement, tally, shipping, and inspection of yard, factory, and shop lumber; basic provisions for selection and inspection of softwood dimension and timbers where working stresses are required; standard designs and sizes of moldings; uniform patterns for worked lumber; standards for red cedar shingles; and provisions for certification of quality and manufacture through grade marking and car tally cards.

The central committee has also approved recommended American standards for nomenclature for domestic hardwoods and basic grading provisions for hardwood factory lumber, formulated largely by the National Hardwood Inspection Rules Committee. The new rules for hardwood factory lumber issued by the National Hardwood Lumber Association are based on these basic grading provisions.

The principal accomplishments of the past year were the formulation of minor revisions, mostly in the basic provisions on structural timbers, to be recommended to the next General Lumber Conference at the Department of Commerce, when held; and of greater importance the 1931 revision of the "7,000 series" of American standard moldings in accordance with practical manufacture and good architecture, and their publication and distribution to the trade. Pending their inclusion in Simplified Practice Recommendation No. 16, to take the place of those molding patterns there shown, copy of the new Standard Wood Molding Book is available from the central committee.

## IX. STANDARDIZING ACTIVITIES OF TECHNICAL SOCIETIES AND TRADE ASSOCIATIONS

In this chapter are given brief summaries of the standardization activities of national technical societies, trade associations, and similar organizations making simplification and standardization work one of the important features of services to their members.

There are reproduced herein outlines relating to standardizing activities of 301 organizations with particular reference to work performed within the past year.

There has been a reduction during the past year in the number of organizations reporting on their standardization work. The reduction is attributable to a minor extent to the fact that in several instances associations ceased to function, but to a greater extent to temporary suspension by many associations of certain of their activities, including simplification and standardization, because of existing industrial conditions. Moreover, a few associations have consolidated with other organizations.

Information concerning organization, procedure, and past activities of the work in standardization of many associations and societies given in this chapter may be found in previous editions of the Standards Yearbook.

### STANDARDIZING AGENCIES ALPHABETICALLY ARRANGED

**Abrasive Paper and Cloth Manufacturers Exchange**, R. P. Carlton, chairman of standardization committee, care of Minnesota Mining & Manufacturing Co., 797 Forest Street, St. Paul, Minn. The standardization committee of this organization has been actively engaged during the past year in standardizing machine methods for analysis of grades in abrasive mineral. The committee is also devoting considerable time to studies of waste in the industry.

**Amateur Athletic Union of the United States**, Daniel J. Ferris, secretary, 233 Broadway, New York, N. Y. This organization has adopted standard contest rules for the various sports under its jurisdiction, including boxing, wrestling, swimming, basket ball, running, handball, walking, jumping, pole vaulting, hammer throwing, javelin, discus, volley ball, indoor baseball, ice hockey, etc. The union has also adopted specifications covering construction and measurements of implements and apparatus used in various athletic sports.

**American Association for Hygiene and Baths**, Arthur M. Crane, secretary,

P. O. Box 307, Gary, Ind. This organization prepared swimming-pool standards which have been credited with being the forerunner of State and municipal regulations. It has also formulated suggested shower-bath standards which have been practically accepted as standard practice.

**American Association of Medical Milk Commissions (Inc.)**, Harris Moak, secretary, 360 Park Place, Brooklyn, N. Y. During the past year this organization revised and issued its methods and standards for the production of certified milk. Any dairyman whose milk meets the standards is permitted to use the association's seal on milk bottles bearing the term "certified milk." Continued use of these seals is based on weekly examination and inspection of sample milk by local medical milk commissions.

**American Association of Nurserymen**, Charles Sizemore, secretary, Louisiana, Mo. The standardization committee of this organization completed a revision of the horticultural standards covering rules and definitions for grading deciduous and evergreen trees



and shrubs, vines, herbaceous perennials, and fruit trees.

American Association of State Highway Officials, W. C. Markham, secretary, National Press Building, Washington, D. C. This association has issued standard specifications for highway bridges and incidental structures which cover construction and design of concrete, masonry, and steel highway bridges, including specifications for structural, rivet, and eyebar steel, steel forgings and castings, wrought iron, iron castings, etc. It has also prepared tentative standard specifications for concrete pavements. The association is at the present time co-operating with the Bureau of Standards on tests in connection with the preparation of a revised standard for highway signs, which will combine tentative standards heretofore issued for rural roads and municipal streets. It is officially represented on three ASA sectional committees on projects relating to civil engineering.

American Association of Textile Chemists and Colorists, A. Newton Graves, secretary, care of Franklin Process Co., Providence, R. I. Under the direction of the research committee of this association 18 subcommittees have been formulated to carry work on various projects leading to standardization of materials. The association has adopted standard methods for determining the fastness of dyes on the fiber; fastness tests for dyed or printed cotton; standards for comparison as to shade or color and staining of white cotton; fastness to fulling of dyed cotton against white cotton, silk and wool; fastness to chlorine, and stoving; fastness tests for dyed or printed rayon; fastness tests for dyed or printed silk; tentative standards for comparison with respect to alteration in color; methods of test for fastness to fulling; degumming and stoving of dyed silk; dyed wool; washing or laundering of dyed woolen material; fulling, scouring, and mill washing; dry and wet heat; and laboratory test for fastness to fulling. In addition, the association has also adopted standard tests relating to fastness to acids and alkalis and to selection of standards, carbonizing, sea water, and crocking. The association maintains two research associates at the Bureau of Standards and another at the Lowell Textile Institute carrying on research on action of light on silk; tests of waterproofed fabrics; fast-

ness to light of dyed fabrics; determination of iso-electric point of wool; fastness to fulling of dyed wool; carbonization of wool; etc.

American Automobile Association, Ernest N. Smith, executive vice president, Pennsylvania Avenue at Seventeenth Street, NW., Washington, D. C. Through its national committee on highway widening and planning this association is engaged in formulating standards for the elimination of bottle necks and points of congestion on streets and highways. In cooperation with the Bureau of Standards it prepared and distributed pamphlets on brake testing and headlight testing, and charts for the standardization of headlight adjustments. It has adopted a code for the promotion of safe driving and the removal of irresponsible drivers from the highways. It also promulgated the model AAA safety-responsibility bill for adoption by all States in lieu of compulsory automobile liability insurance. This association served as joint sponsor for the sectional committee on safety code for automobile brakes and brake testing, functioning under the rules of procedure of the American Standards Association. It is officially represented on the ASA sectional committee for a code of street-traffic signs, signals, and markings. This association adopts the specifications for automobiles participating in championship races. Out of the stress and strain of these races have come many refinements and improvements to the automobile. Tests of automotive and allied products under standard rules have become one of the major functions of the contest board which offers a medium for the industry to have its wares certified to the car-owning public.

American Bottlers of Carbonated Beverages, Junior Owens, secretary, 726 Bond Building, Washington, D. C. This association's Educational Bulletin No. 4 contains completed standards for bottle boxes, water supply lines for carbonators (pump inlets), carbonator-filler carbonated water connections, sirup line connections, straight pipe threads, tapered pipe threads, conveyor chains, crown finish for beverage bottles, and bottle-washing compound. Included also are recommended practices dealing with rubber hose and block tin tubing, compression couplings, carbonated water and sirup valves, gas volume tests, and beverage bottles, the latter prepared in cooperation with



the division of simplified practice of the Bureau of Standards. The association has inaugurated a certification plan, through which it publishes, with certain of its standards, lists of manufacturers guaranteeing compliance with the requirements of the standards.

American Bureau of Shipping, J. W. Cantillion, secretary, Stevenson Taylor Memorial Building, 24 Old Slip, New York, N. Y. This bureau cooperates with the American Marine Standards Committee in the development of standards for materials, fittings, equipment, and structural methods. It issues periodically a publication known as Rules for Building and Classing Steel Vessels in which are included the general requirements for the hull structure, machinery, and deck equipment for vessels.

American Bureau of Welding, William Spraragen, secretary division of engineering, National Research Council, 29 West Thirty-ninth Street, New York, N. Y. The work of the bureau is carried on by several committees engaged in various projects. The committee on standard tests for welds has issued new specifications for various types and tests of welds. The committee on welding wire specifications completed new specifications for welding wire, while studies on welded rail joints and structural steel have been completed by committees handling these projects. At the request of the Bureau of Standards, the American Bureau of Welding formulated procedural specifications for use in connection with the preparation of aircraft joints to be tested. The bureau cooperated with the American Society of Mechanical Engineers in the preparation of the code for unfired pressure vessels. One of the most important reports of recent years published by this bureau is that of the structural steel welding committee covering results of tests of several thousand specimens.

American Ceramic Society, Ross C. Purdy, secretary; Arthur S. Watts, chairman of standards committee, 2525 North High Street, Columbus, Ohio. This association has adopted standards relating to various clays, ceramic whitening, limestone, lime, enamel, glass, sand, and other ceramic materials, as well as standard tests and testing apparatus for many ceramic products. It cooperated in the establishment of the commercial standard relating to grades of feldspar and in the formulation of the simplified practice recommendation for malleable foundry refractories. The society is continuing

its work on the development of standard definitions for all white wares, including china, porcelain, earthenware, and numerous related wares.

American Chemical Society, Charles L. Parsons, secretary, Mills Building, Washington, D. C. Through the work of several of its committees, the society has published Unit Weights for the Purchase of Reagents, a set of suggested standard weights for the packaging of 164 laboratory chemicals, and a report setting forth recommendations for items of certain types of apparatus to be kept in stock by dealers and in laboratory storerooms for ordinary laboratory work. The society has in operation a plan whereby dealers are induced to stock reagent chemicals in metric unit weights and in the standard packages recommended by it. The names of those dealers who comply with these requirements are published in the society's journals twice a year. The committee on analytical reagents, which has published more than 100 standards for chemical reagents, is continuing its work along this line.

American College of Surgeons, 40 East Erie Street, Chicago, Ill. Franklin H. Martin, director general; Malcolm T. MacEachern, M. D., associate director and director of hospital activities; Bowman C. Crowell, M. D., associate director and director of clinical research. This organization in 1930 issued a manual containing complete information regarding a standard classification and nomenclature for surgical dressings and proposed standard specifications for sponges, abdominal packs, sterile gauze dressings, and pads. It also prepared and adopted minimum standards for the organization of clinics for the diagnosis and treatment of cancer, and for industrial medicine and traumatic surgery. It initiated and cooperated in the preparation of the commercial standard for steel bone plates under the procedure of the Bureau of Standards.

American Concrete Institute, Harvey Whipple, secretary, 641 New Center Building, Detroit, Mich. This institute has adopted about 40 standards, tentative and proposed specifications, and recommended practices covering uses and applications of concrete and reinforced concrete. Included among these standards are the following, which were adopted during the last year and published by the institute: Tentative specifications for cast stone; proposed specifications for concrete pavement in municipalities; and tentative specifications for concrete burial vaults. Reports have been prepared

by committees of the institute dealing with proposed specifications for the design of reinforced concrete chimneys and the construction of foundations for later publication. The institute has organized a new committee to consider a report on recommended practice in architectural monolithic concrete building construction. The standard code committee is preparing a report for presentation at the institute's next annual convention recommending a change in the institute's building regulations for concrete as adopted by many cities throughout the country. The institute is officially represented on three sectional committees functioning under American Standards Association procedure.

American Concrete Pipe Association, M. W. Loving, secretary, 33 West Grand Avenue, Chicago, Ill. Specifications of the American Society for Testing Materials for plain or unreinforced concrete pipe and for reinforced concrete pipe have been adopted by this association. It cooperated in the preparation of the American standard for drain tile. As a member of the Joint Concrete Culvert Pipe Committee, it cooperated in the preparation of the specifications for reinforced concrete culvert pipe.

American Dental Association, Dr. Harry B. Pinney, secretary, 212 East Superior Street, Chicago, Ill. The standardization work of this association is conducted through its research fellowship maintained at the Bureau of Standards. It has formulated standards for dental amalgam alloys, inlay casting investment, inlay casting waxes, impression compounds, inlay casting golds, and dental mercury. During the past year it developed specifications for wrought gold alloys used in prothesis and orthodontia. Manufacturers of dental materials are advertising the fact that their products comply with the requirements of the specifications, and are issuing certificates guaranteeing such compliance. In addition to the certificate, satisfactory evidence of physical tests must be submitted to show that the manufacturer has tested his material and that its properties meet the specifications' requirements. A list of products so certified is published from time to time. The bureau of chemistry maintained by this association examines new proprietary products with the view to preparing chemical specifications. The council on dental therapeutics of the association was organized as a permanently

functioning body to advise the dental profession and the public concerning dental proprietary and nonofficial remedies and materials with regard to their composition and therapeutic usefulness. It lists materials as "accepted nonofficial dental remedies" when the articles are found to comply with the following rules: The composition of the article must be published; tests for determining its composition must be furnished; it must not be advertised to the public (except that disinfectants, dentifrices, and medicinal foods may be advertised within certain limits); there must be no false or misleading statements as to its origin, preparation, or therapeutic value; its name must not be misleading; and it must not be useless.

American Dental Trade Association, George A. Lilly, managing director, 839 Seventeenth Street NW., Washington, D. C. This association undertook a simplification and standardization program which resulted in the elimination of unnecessary varieties and types of dental hypodermic needles, plaster and investment containers, dental grinding wheels, color of dental rubbers, mouth mirrors, and brush wheels. Practically all of this work has been conducted in cooperation with the division of simplified practice of the Bureau of Standards, under whose auspices there have already been established simplified practice recommendations covering several of the above-mentioned items.

American Drug Manufacturers Association, Carson P. Frailey, executive vice president and secretary, Albee Building, Washington, D. C. The work of standardizing drugs is carried on by this association through the activities of several committees organized for this purpose. Many members of these committees serve as associate members on various revision committees engaged in the revision of the United States Pharmacopoeia and the National Formulary. The committee on analytical assay methods submitted a preliminary report on the assay of ephedrine inhalants which contained in detail two tentative analytical procedures for adoption. The committee on chemical tests and standards devoted much of its time during the past year to a study of proposed tests for various chemicals. The committee on synthetic organic chemicals conducted investigations in an attempt to work out a more satisfactory method of analysis for organic mercurials. The committee on vitamin assay of cod-



liver oil submitted methods for vitamins A and D which were presented at the League of Nations Permanent Commission on Biological Standardization for consideration for adoption as international standards.

American Dry Milk Institute (Inc.), Roud McCann, director, 221 North La Salle Street, Chicago, Ill. This institute has issued a booklet which sets forth standard methods of analysis used in establishing grades of dry skim milk. At the present time the institute is conducting studies which have for their purpose the improvement of grading methods. Studies are also under way on bacteriological methods for dry skim milk, the relationship of solubility index to moisture content during storage, and the development of rancid or tallowy odors of fat in dry skim milk during storage.

American Electric Railway Association. (Name changed to American Transit Association, see p. 188.)

American Electro-Platers' Society, H. A. Gilbertson, secretary-treasurer, 434 South Wabash Avenue, Chicago, Ill. This society is cooperating with the American Society for Testing Materials and the Bureau of Standards in a study of the protective value of plated coatings on steel. Several thousand samples were plated at the Bureau of Standards by the society's research associate and are now exposed in six different test fields maintained by the ASTM where they are being inspected at regular intervals. It is believed that these tests will lead to conclusions upon which standards and specifications for plated coatings can be based. Studies of laboratory accelerated tests are also being made with similar samples. A subcommittee of the society's research committee is now engaged in the preparation of specifications for materials such as salts and anodes that are used in electroplating.

American Face Brick Association, George S. Eaton, secretary-treasurer, 205 West Wacker Drive, Chicago, Ill. During the past year this association adopted a set of grading rules for face brick. The association's committee which was responsible for the development of these grading rules is at the present time working on a change in the provisions regarding chippage. In cooperation with the Common Brick Manufacturers Association of America, it assisted in the establishment of the simplified practice recommendation relating to sizes of face and common brick.

American Foundrymen's Association (Inc.), R. E. Kennedy, technical secretary, 222 West Adams Street, Chicago, Ill. The association cooperates with the American Society for Testing Materials in developing specifications for cast products. It has sponsored the Joint Committee on Pattern Equipment, which formulated standards for pattern and core-box color markings and for pattern plate lugs and vibrators, as well as the Joint Committee on Foundry Refractories, which prepared standards for shapes and sizes of malleable furnace refractories. The association has adopted standard methods for testing and grading foundry sands, worked out by its committee on foundry sands. The foundry safety and sanitation code developed in cooperation with the National Founders Association has been approved as standard under the procedure of the ASA. The organization is joint sponsor with the American Ceramic Society for the Joint Committee on Standardization Tests for Foundry Refractories and with the American Society of Mechanical Engineers for a joint committee to consider standardization of foundry equipment. It is joint sponsor for 3 ASA sectional committees and is represented on 11 others.

American Gage Design Committee, H. W. Bearce, secretary, Bureau of Standards, Washington, D. C. During the past year the full committee held two meetings and the technical subcommittee held several additional meetings, and also completed much preliminary work through correspondence. An extension of the gage design standards for plain and thread plug and ring gage blanks covering the size range of  $4\frac{1}{2}$  to 12 inches has been tentatively approved, and work on a complete series of adjustable snap gages covering the size range 0 to 12 inches is well advanced. Consideration has also been given to certain other types of gages, including the ordnance type combination ring and snap gage, length snap gages, pipe thread gages, and flush-pin gages. The work of the committee is being continued.

American Gas Association (Inc.), Alexander Forward, managing director, 420 Lexington Avenue, New York, N. Y. This organization conducts many research activities relating to problems affecting the production, distribution, sale, and utilization of gas at its own laboratories, those of Rutgers University, and the department of engineering research of the Uni-



versity of Michigan, and the laboratories of commercial organizations specializing in various industrial processes that require the use of heat. Research associates are maintained at the Bureau of Standards carrying on research work in connection with gas combustion and pipe corrosion and protective coatings. Appliances which meet the construction and performance requirements of the American Gas Association and which are approved by the association's laboratory are required to display the laboratory seal of approval. Approval requirements are now in effect for central house heating gas appliances, house piping and appliance installation, flexible gas tubing, gas ranges, gas water heaters, space heaters, hot plates and laundry stoves, clothes dryers, incinerators, and gas-heated ironers. Work is now nearing completion on requirements or listing requirements for hotel and restaurant ranges, garage heaters, industrial gas boilers, gas refrigerators, installation of conversion burners, draft hoods, gas cocks, and gas, pressure, and temperature control accessories. A very extensive research program in the utilization of mixed gases extending over a period of more than five and one-half years was recently completed at the association's laboratory. An investigation dealing with the construction, repair, and testing of pipe joints which has been under way at the laboratory since 1929 is also nearing completion. The association is carrying on fundamental research in the standardization of orifice meters for large-volume high-pressure gas transmission lines and is developing basic formulas for calculating the capacity under varying conditions of long-distance high-pressure lines. It has cooperated with the Bureau of Standards in the formulation of the commercial standard relating to standard weight malleable iron or steel screwed unions. The association is sponsor for the ASA sectional committee on gas appliances.

American Gear Manufacturers Association, J. C. McQuiston, secretary, First National Bank Building, Wilkesburg, Pa. The general standardization committee of this association has arranged a standardization program which has been published in printed form. This program is revised at certain intervals and serves as an up-to-date guide for the various subcommittees and also as a ready cross-reference index for each member company to show what has been ac-

complished, the dates of adoptions and revisions. The various subcommittees are constantly at work on projects dealing with the following subjects: Bevel and spiral bevel gears; differential and transmission; railway, mill, and mine gears; herringbone gears; keyways; metallurgical; nomenclature; nonmetallic gears; spur gears; sprockets and chains; tooth forms; and worm gears. It is serving as sponsor or joint sponsor for two sectional committees of the American Standards Association on standardization of gears and on transmission chains and sprockets.

American Home Economics Association, Alice L. Edwards, executive secretary, Mills Building, Washington, D. C. This association cooperated with units of industry in the formulation and acceptance of commercial standards for dress patterns, men's pajamas, wall paper, plate-glass mirrors, and wool and part wool blankets. It is a member body of the American Standards Association, and is represented on ASA sectional committees now working on the standardization of plumbing equipment, standards and specifications for refrigerators, specifications and standards for bed sheets and sheeting, and approval and installation requirements for domestic gas-burning appliances. The association is cooperating in a research study on the changes in solubility and absorption spectra of silk fibroin caused by tin weighting. It publishes suggestions for club programs, including the discussion of methods of household purchasing, labeling of commodities with information concerning their properties, use of standard specifications, etc. Thirty-two of the affiliated State home economics associations have committees on standardization and are active in promoting the association's standardization program. The division of textiles and clothing has taken up work on the simplification of clothing terminology. At the 1931 annual meeting of the association resolutions were adopted by which members pledged themselves to cooperate with the retailers in their own communities to further the purchase and sale of consumers' goods labeled according to standards set up through the American Standards Association, the Bureau of Standards, or the Bureau of Agricultural Economics of the United States Department of Agriculture, or labeled in some other way with accurate measurements as to quality and performance. The associa-

tion also indorsed the efforts being made by its committee on standardization of consumers' goods to secure labels on commodities sold on the retail market by which the quality specifications for a commodity will appear on the label. This committee has published three of a series of leaflets as follows: No. 1, When You Buy Sheets; No. 2, When you Buy Blankets; and No. 3, When You Buy a Refrigerator. These have been prepared for the purpose of indicating to the purchaser, manufacturer, and retailer specific information considered essential for the wise selection of these commodities and to suggest the type of information desired in the selection of others.

American Hospital Association, John M. Smith, chairman, committee on simplification and standardization, care of Hahnemann Hospital, 230 North Broad Street, Philadelphia, Pa. This association cooperated in, and in several cases requested the establishment of, commercial standards for clinical thermometers, rubber sheeting, steel bone plates and screws, surgeons' latex gloves, and surgeons' rubber gloves. These were established under the auspices of the Bureau of Standards. Through its committee the association sponsored the movement for the formulation of simplified practice recommendations relating to hospital beds, chinaware, plumbing fixtures, hospital and institutional cotton textiles, and surgical dressings, conducted also under the auspices of the Bureau of Standards. At the present time the committee is carrying on work looking toward the standardization of mattresses for beds and cribs, pillows, chrome stainless or rustless steel for surgical instruments, and cribs and bassinets.

American Institute of Architects, Structural Service Department, F. Leo Smith, technical secretary, 1741 New York Avenue NW., Washington, D. C. Standardizing activities of the institute are conducted principally through cooperation with other national groups and organizations engaged in standardization work. The structural service committee, with an advisory council and representatives in the 67 chapters of the institute, makes possible the obtaining of group opinions reflecting the viewpoint of the architectural profession. Standard documents and forms for the purpose of establishing uniform practice in the building industry have been adopted by the institute. The standard contract documents include a standard form of agreement between contractor

and owner for construction of buildings; general conditions of the contract for the construction of buildings; standard form of bond; standard form of subcontract and standard form of acceptance of subcontractor's proposal. Other standard documents are: Standard form of agreement between owner and architect (percentage basis); form of agreement between owner and architect (fee plus cost system); a form of agreement between owner and contractor (cost plus fee basis); standard form of competition program; a standard method of calculation and form of statement of cubic contents of buildings; standard symbols for wiring plans; and a standard filing system. The standard filing system, adopted by the institute in 1920, with subsequent revisions, provides for the premarking and filing of trade and technical literature relating to building materials and equipment. The institute is joint sponsor for six sectional committees of the American Standards Association. It is also represented on 25 other ASA sectional committees, 10 committees of the American Society for Testing Materials, and 6 committees of the National Fire Protection Association. It cooperates with the several divisions of the Commercial Standardization Group of the Bureau of Standards in the establishment of commercial standards and simplified practice recommendations covering building materials; also in the development of building codes and in the promotion of certification and labeling activities among the architectural profession. It also cooperates with the National Committee on Wood Utilization in promoting the efficient use of wood in building construction.

American Institute of Chemical Engineers, Frederic J. LeMaistre, executive secretary, Bellevue Court Building, Philadelphia, Pa. Three committees of this institute are actively carrying forward work on the following projects leading to the formulation of standards: Evaporator test codes; system of symbols and nomenclature; and specifications for pressure and vacuum gages. The first and third mentioned activities are being conducted in cooperation with the American Society of Mechanical Engineers.

American Institute of Electrical Engineers, H. H. Henline, acting national secretary, 33 West Thirty-ninth Street, New York, N. Y. The revised standards of the institute are being published in the form of individual sections. Thirty-eight sections, each dealing with standards for a specific sub-



ject, have been completed. Of these 38 standards, 19 have been approved as American Standards under American Standards Association procedure. The institute is a member body of the American Standards Association and is represented on the electrical standards committee. It is sponsor or joint sponsor for a number of sectional committees, among which may be mentioned: Industrial electrical control apparatus; insulators for electric-power lines; electric-arc-welding apparatus; electric resistance welding apparatus; electrical measuring instruments; hard-drawn aluminum conductors; mercury-arc rectifiers, railway motors; railway control apparatus; storage batteries; electrical definitions; radio, scientific, and engineering symbols and abbreviations; code on protection against lightning; symbols for electrical equipment of buildings; and mine locomotive control apparatus.

One of the technical committees of the institute is now at work on the development of a series of test codes covering the principal types of electrical apparatus. The first of these, the test code for transformers, has been issued in preliminary form. It is the purpose of these codes to provide in convenient reference form the more generally applicable and accepted methods of conducting and reporting tests applying to the fulfillment of the performance guarantees specified in AIEE standards.

American Institute of Homœopathy, Garth W. Boericke, M. D., chairman of pharmacopœia committee, care of Hahnemann Medical College of Philadelphia, 235 North Fifteenth Street, Philadelphia, Pa. This institute has prepared and issued the third revision of the Homœopathic Pharmacopœia of the United States in which are listed and described the strengths of tinctures, dilutions, medications, and triturations for all drugs recognized as standard in the use of preparations of homœopathic remedies.

American Institute of Mining and Metallurgical Engineers, A. B. Parsons, secretary, 29 West Thirty-ninth Street, New York, N. Y. A final report dealing with dangers from oil and gas wells to coal-mining operations, and draft of a model law for use of the legislature of any State concerned have been adopted by the institute. A committee of the metals division of the institute cooperated with the division of simplified practice in the establishment of the simplified-practice recommendation for malleable foundry practices. A proposed safety

code for coal-mine ventilation is now being considered by the institute's coal division. It is serving as sponsor for the following three projects under ASA procedure: Rock dusting of coal mines, methods for screen testing of ores, and specifications for clean bituminous coal.

American Institute of Refrigeration, J. F. Nickerson, general secretary, 435 North Waller Avenue, Chicago, Ill. Practically all standardization work of this institute is conducted in cooperation with the American Standards Association through representation on sectional committees dealing with the formulation of standards for cast-iron flanged ammonia and screwed fittings, refrigerating piping, pressure and vacuum gages, and household refrigerators.

American Institute of Steel Construction (Inc.), Charles F. Abbott, executive director, 200 Madison Avenue, New York, N. Y.; Lee H. Miller, chief engineer, 1050 Leader Building, Cleveland, Ohio. The standards of this institute, which are included in its Standard Handbook of Steel Construction, have already been accepted by more than 330 cities and 17 State bodies. Members of the institute who adhere to its code of standard practice are permitted to use the institute's symbol as a label for their commodities.

American Institute of Weights and Measures, W. R. Ingalls, president, 33 Rector Street, New York, N. Y. This institute concerns itself generally with the subject of weights and measures, including their standards and their use in the arts and commerce.

American Leather Belting Association, J. L. Nelson, secretary, 41 Park Row, New York, N. Y. During the past year this association established specifications setting forth standard thickness for the purchase of first quality leather belting. These specifications are intended to serve as a protection to consumers of leather belting in that it substitutes the thickness in  $\frac{3}{4}$ -inch units for the earlier terminology of "ounces per square foot" thereby making it comparatively easy to check each piece of belting to determine if the thickness is as ordered.

American Marine Standards Committee. (See Ch. VIII, p. 166.)

American Medical Association, Committee on Foods, Raymond Hertwig, secretary, 535 North Dearborn Street, Chicago, Ill. This committee is co-operating with the food industry for the development of a system by which the industry may regulate and con-



trol its own advertising in the interest of public welfare. The plan of operation of the committee, among other things, includes the "acceptance" of truthfully and correctly advertised wholesome foods which fulfill nutritional requirements; the formulation of general rules and regulations proposed for governing food labels and advertising; the promulgation of general committee decisions portraying the requirements and policies of the committee on specific advertising claims and nutritional values of specific foods and offered for the guidance of food manufacturers and advertising agencies; and the publication of an authoritative text on foods of the American market, including information on its "accepted" and "rejected" foods, and intended for the special use of physicians, dietitians, hospitals, the food industry, and the public. The committee grants to manufacturers of foods the privilege to display its "seal of acceptance" on all products which have been found to comply with its rules, regulations, and requirements.

American Medical Association, Council on Pharmacy and Chemistry, W. A. Puckner, secretary, 535 North Dearborn Street, Chicago, Ill. New and Nonofficial Remedies is a book in which are listed and described such medicinal preparations as stand accepted by this council on January 1 of the year of publication. The descriptions of accepted articles are based in part on investigations made by, or under the direction of, the council, and in part on evidence or information supplied by the manufacturer. The publication of this book annually indicates the efforts which the council is making toward the standardization of medicinal products. The council on pharmacy and chemistry grants the privilege of the display of its "seal of acceptance" to show that the accepted products comply with the requirements of its rules, regulations, and standards.

American Medical Association, Council on Physical Therapy, H. A. Carter, secretary, 535 North Dearborn Street, Chicago, Ill. One of the outstanding accomplishments of this council during the past year has been the publication of the Handbook of Physical Therapy in which is set forth valuable information relating to present standard forms and procedures of physical therapy as well as the types of apparatus to be used in connection therewith. In cooperation with the ASA sectional committee on definitions of electrical terms, this council has com-

pleted and published standard definitions and terms used in physical therapy.

American Mining Congress, J. F. Callbreath, secretary, Munsey Building, Washington, D. C. Through its national standardization division, composed of two branches, coal and metal, and consisting of 37 metal and 75 coal producing companies and 74 manufacturers of mining equipment and machinery, the American Mining Congress has prepared and adopted the following standards which have also been approved by the American Standards Association: Coal-mine ventilation; underground transportation in metal mines; safety rules for installing and using electrical equipment in coal mines and metal mines; coal-mine drainage; wire rope for mines; ladders and stairs for mines; miscellaneous outside coal handling equipment; fire-fighting equipment in metal mines; transportation safety code for coal mines; mechanical loading in metal mines; and underground transportation in coal mines. Committees of the standardization division are now engaged in the following projects: Mechanical loading of coal, mine timbering, metal mine cost accounting, drilling machines and drill steel, locomotives for coal mines, coal-mine cars, and coal-mine tracks. The American Mining Congress is sponsor or joint sponsor for 15 sectional committees functioning under the rules of procedure of the American Standards Association.

American Oil Burner Association (Inc.), Harry F. Tapp, executive secretary, 342 Madison Avenue, New York, N. Y. A model ordinance governing the construction and installation of oil-burning equipment for use by municipal authorities having jurisdiction over such installations has been adopted and recommended by this association. It cooperated with the Bureau of Standards and the industry in the establishment of the commercial standard for domestic and industrial fuel oils. The association is continuing its technical research program with the American Society of Heating and Ventilating Engineers in making tests of different types of oil burners under various conditions. It maintains and operates the Oil Heating Institute.

American Oil Chemists' Society, J. C. P. Helm, secretary, 705 Tchoupitoulas Street, New Orleans, La. This organization has adopted official methods of chemical analysis for coconut oil, corn oil, cottonseed and cottonseed

cake, meal, meats, hulls, and oils. It has also adopted official methods for commercial fats and oils, peanut oil (crude), refined oils, soap stock, and soya bean oil (crude).

**American Optometric Association (Inc.)**, Edwin H. Silver, associate director, department of research, 1410 G Street NW., Washington, D. C. A national advisory commission on vision for motor drivers, appointed by this association at the instance of the National Conference on Street and Highway Safety, has prepared standards of visual acuity for motor-vehicle operators. In cooperation with the National Research Council, this organization is continuing its investigation concerning limits of safety vision at Iowa State College.

**American Paint and Varnish Manufacturers Association (Inc.)**, National Paint, Oil, and Varnish Association (Inc.), and National Association of Paint Distributors (Inc.), George V. Horgan, general manager, 2201 New York Avenue NW., Washington, D. C. At the last annual convention of these organizations (which represent the paint and varnish industry) official endorsement was given for putting into effect the simplification and standardization program developed by a joint committee representing these associations and the industry. It is expected that this program will effect material savings in the industry through the elimination of waste in overhead expenses, resulting from the reduction of the number of tints and colors marketed in various lines of products and the number of sizes of containers used. The marketing changes effected by these organizations received the approval of the division of simplified practice of the Bureau of Standards.

**American Paper and Pulp Association**, Charles W. Boyce, executive secretary, 370 Lexington Avenue, New York, N. Y. In cooperation with the National Paper Trade Association, the committee on simplification and standardization of this association submitted a report at the joint annual meeting of both organizations in 1932 in which it recommended standard sizes of sample books issued by mills and paper merchants, and also a standard filing system. This association cooperated in the establishment of the simplified practice recommendation relating to sizes and grades of paper conducted under the auspices of the Bureau of Standards.

**American Petroleum Institute**, W. R. Boyd, jr., executive vice president, 250 Park Avenue, New York, N. Y.

This institute has adopted 21 standards of the American Society for Testing Materials relating to methods of test for petroleum products. It cooperated with the Bureau of Standards in the establishment of commercial standards for diamond core-drill fittings, domestic and industrial fuel oils, and steel and wrought-iron pipe nipples. As an aid to international interchangeability in pipe threads, cable tool joint threads, rotary tool joint threads, sucker-rod threads, and limit gages therefor, the institute has completed arrangements with the Government laboratories of America, England, and Germany by which each of these national standardizing institutions is made an official testing and certifying agency for thread gages made in accordance with the specifications of the American Petroleum Institute. In promoting the use of its standards and specifications throughout the industry the institute grants to manufacturers the right to place its official monogram on certain standardized equipment, certifying that the material so marked complies with all of the conditions and standards contained in the official publications relating thereto. The institute reserves the right to revoke the use of its monogram for any reason satisfactory to the board of directors. The institute maintains a group of research associates at the Bureau of Standards dealing with composition and properties of petroleum and with protective coatings for pipe lines. It is also conducting cooperative fuel research with the National Automobile Chamber of Commerce and the Society of Automotive Engineers.

**American Pharmaceutical Association**, E. F. Kelly, secretary, 10 West Chase Street, Baltimore, Md. Committees of this association are functioning on such subjects as the revision of the National Formulary, a publication supplemental to the United States Pharmacopœia; tolerances for prescriptions and for prescription containers; physiological testing of drugs; cooperation with foreign associations in bringing about international uniformity in pharmaceutical nomenclature; preparation of unofficial standards for drugs and chemical products; publication of a recipe book, containing standard formulas and recipes not found in the Pharmacopœia or the National Formulary; uniform state legislation in reference to narcotic drugs; cooperation with other scientific bodies on the question of horticultural nomenclature; extension of the use of the met-



ric system in pharmacy; and investigation of the light-protecting properties of various colored glass containers, with a view to preparing specifications for colored glass containers for the protection of medicaments. In 1930 a conference of pharmaceutical law-enforcement officials was formed to bring about greater uniformity in the pharmaceutical legislation of the several States and in the enforcement of these laws. The association has recently cooperated in organizing the Inter-Society Color Council to develop uniform definitions and standards for colors.

American Public Health Association, Kendall Emerson, M. D., acting executive secretary, 450 Seventh Avenue, New York, N. Y. Standardization work of this association is carried on by about 50 committees functioning under the supervision of the committee on research and standards. It is the duty of this committee to conduct research and to develop standards in the technical branches of public health service and training, and the coordination of such research and standardization. Standards relating to minimum qualifications for those appointed to positions in public-health nursing, essential features in the design of sanitary drinking fountains, and standard classified nomenclature of disease, have been approved by this committee. In cooperation with the American Water Works Association, this organization formulated and adopted standard methods of water and sewage analyses which were revised and approved by the committee on research and standards, and published as the seventh edition. At the present time the committee is concerned with the standardization of laboratory reagents, of standard methods of preparation of certain vaccines, and of ventilation requirements for indoor living quarters.

American Railway Association, H. J. Forster, secretary, 30 Vesey Street, New York, N. Y. The activities of this association are conducted under nine divisions, five of which are concerned with matters which have led to the adoption of standards, specifications, and recommended practices, namely: Operating (dealing with problems of operation); engineering (dealing with the location, construction, and maintenance of railroads); mechanical (conducting work in the construction and maintenance of rolling stock); purchases and stores (which deals with the purchasing, storing, distribution, and selling of materials and supplies); and freight claim (dealing with the

formulation of standard recommended practices to govern freight losses and claims). The other divisions are as follows: Transportation (formulates rules and practices upon questions affecting the uniform and efficient use of equipment in interchange between carriers); traffic (acts as the liaison between the other divisions of the association and the territorial organizations of railroad officials having to do with rates, fares, or classifications for rating); motor transport (acts as a clearing house for transportation thought and development of motor transportation by railways); car service (functions through the utilization of district managers located at strategic points throughout the country; asment and through education in the sists the carriers in increasing the efficiency of the transportation service generally in the interchange of equip-heavier loading of equipment). (See sketches of the Freight Claim, Mechanical, Operating, and Purchases and Stores Divisions; the American Railway Engineering Association, which functions as the engineering division of the American Railway Association; also the Signal and Telegraph and Telephone Sections and the Freight Container Bureau.) The association has organized three committees which do not function under the above-noted divisions, namely, the committee on automatic train control, which is engaged on the standardization of automatic train-control devices; the joint committee on grade crossing protection, doing similar work for the automatic highway grade-crossing signals; and the joint committee on cooperation of the freight container bureau, which assists shippers in the preparation of their containers and methods of handling.

American Railway Association, Electrical Section, E. H. Fritch, secretary, 59 East Van Buren Street, Chicago, Ill. Several committees of this section are actively carrying on work in preparing reports relating to the development of standards and specifications for the following items: Transmission lines and catenary construction; insulating tape; porcelain insulators; track and third-rail bonds; design of indoor and outdoor substations; and high-voltage cables. These reports are to be considered for approval at the next annual meeting of this section.

American Railway Association, Freight Claim Division, Lewis Pilcher, secretary, 59 East Van Buren Street, Chicago, Ill. This division publishes



a book of Freight Claim Rules or manual of practices (revised annually) in which are carried the rules and standards prescribed for the investigation and interline apportionment of claims paid to claimants, lists of freight claim and prevention officers of carriers, uniform blanks, recommended practices in loss and damage prevention work, and other handy information for use of railroad freight claim offices. There are also published and distributed semiannually, in printed form, interpretations of freight claim rules as handed down by the appropriate committee of the division.

American Railway Association, Freight Container Bureau, A. H. Greenly, chairman, joint committee of cooperation on the Freight Container Bureau; Edward Dahill, chief engineer, 30 Vesey Street, New York, N. Y. In all of its work leading to the formation and adoption of recommended methods or practices for packing, boxing, and crating, engineers of this bureau cooperated with the officials of the industrial associations of the manufacturers of these commodities to which attention is being given, and with the container and accessory manufacturers and their associations. It is the practice of the bureau to submit all recommendations to a special committee appointed by the industry to pass on the recommendations before they are approved for printing and distribution. In several cases the bureau has carried on work leading to the preparation of recommended containers and packing methods at the direct request of a trade association, which has approved and adopted the recommendations as standard for its members. The bureau's engineers make shipping and laboratory tests and spend much time at the shipper's plants, at freight stations, and in consignees' receiving rooms, gathering information as to what are the causes for loss and damage to assist in determining how these causes may be eliminated. A considerable portion of the time of those engineers who are working on fresh fruits and vegetables is spent in the producing territories for the purpose of acquainting the shippers with the recommended containers and standard practices for loading and bracing. The bureau cooperates very closely with national and local trade and traffic associations and with various Federal and State agencies. Forty recommended standards relating to various types of containers for packing and shipping of

various commodities have been formulated and covered by illustrated pamphlets which have had a wide distribution. In addition, approximately 100 container specifications and 30 loading methods for fresh fruits and vegetables have been developed and prepared by the bureau for tariffs effective in heavy perishable producing territories. The standards developed and recommended by this bureau are not compulsory by nature. In some instances, however, the recommendations have been accepted and adopted by tariff-issuing agencies of carriers throughout the country, in which case they have become standard in particular instances or in specified tariffs. The bureau has pending and in various stages of completion the following recommended standards: Crates and loading methods for airplanes and airplane parts; crates and method of packing enameled iron and vitreous china sanitary ware, and steel office furniture; construction of crates and inside blocking for porcelain-finished commercial refrigerators; construction of crates and inside blocking for set-up show cases (all glass type); packing of glassware and crockery in fiber boxes; methods of loading and bracing vitrified clay sewer pipe. The bureau's program for the coming year deals with the following projects: Continuation of studies, field work, and laboratory tests on an increasing number and variety of containers used in the fresh fruit and vegetable trade; the development of loading and bracing methods for carload shipments of fresh fruits and vegetables; educational field work in the fruit and vegetable producing territories; development of standard methods of crating and boxing electric refrigerators; development of standard methods of skidding and crating machinery; skids, cradles, and crates for motor boats; the giving of illustrated lectures and demonstrations before colleges, trade associations, groups of shippers, and railroad employees.

American Railway Association, Mechanical Division, V. R. Hawthorne, secretary, 59 East Van Buren Street, Chicago, Ill. Through the activities of its different committees and the investigations and research carried out under their direction, this division has adopted standards and recommended practices for cars and locomotives as follows: Material specifications, 19 standard specifications and 59 recommended practice specifications; gages and testing devices, 49 standards and 10 recommended practices; car de-

signs, recommended practice designs, 4 types of general service cars; car parts and fundamentals of car designs, 43 standards and 20 recommended practices; trucks and truck details for cars, 39 standards and 13 recommended practices; brakes and brake equipment, 40 standards and 13 recommended practices; locomotive parts, 7 standards and 28 recommended practices; electric lighting for cars and locomotives, 1 standard and 6 recommended practices; and miscellaneous standards and recommended practices, 12 standards and 15 recommended practices. All of the division's standards are incorporated in a manual which is revised and supplemented annually. In addition, the division has adopted the following rules: Standard rules for maintenance of air-brake and air-signal equipment on locomotives and cars; rules for fuel economy on locomotives; rules and instructions for inspection and testing of locomotive boilers and rules and instructions for inspection of steam locomotives and tenders; rules governing the condition of, and repairs to, freight and passenger cars for the interchange of traffic; rules governing the loading of lumber, logs, stone, etc., and loading and carrying structural materials, plates, rails, girders, etc.; specifications for safety appliances on cars and locomotives; specifications for tank cars. At the 1932 meeting of the division various committees submitted for approval by the division reports on the following subjects: Revisions of and additions to the loading rules; revisions of and additions to the interchange rules; adoption of recommended practice for globe and angle valves for 300-pound pressure for locomotives; specifications and designs for steel-sheathed, steel-framed box car of 40 and 50 ton capacity for adoption as standard and a number of items for adoption or revision of miscellaneous standards for cars and locomotives. This division maintains at Purdue University, Lafayette, Ind., an air-brake laboratory, draft gear testing laboratory, laboratory for testing tank-car devices, laboratory for testing automatic hose connectors, brake-shoe testing machine, and an air-hose testing machine.

American Railway Association, Operating Division, J. C. Caviston, secretary, 30 Vesey Street, New York, N. Y. This division publishes and keeps under constant revision the Standard Code of the American Railway Association relating to train, block signal, and interlocking rules, and also the

standard definitions for the various terms used in railway operation. In connection with the phase of railway work in which it is engaged, this division has formulated specifications for lanterns for use on crossing gates and by highway crossing watchmen and gatemen; track torpedoes; 5-minute red fuses; and standard drawings relating to approach warning and stop signs, and painting for highway gate arms.

American Railway Association, Purchases and Stores Division, W. J. Farrell, secretary, 30 Vesey Street, New York, N. Y. Standards prepared by committees of this division relate to the following subjects: Purchasing and Stores Department Manual—recommended rules and practices, reclamation practices, scrap classification, material classification, and methods of unit piling materials. It has also adopted recommendations in connection with the standardization of pipe fittings and valves, padlocks, manhole and handhole gaskets, and railway electrification materials; standard types of buildings for storing stock and equipment, paint and oils, explosives, oxygen, and acetylene; garages and lumber sheds; also standard list of stationery items.

American Railway Association, Signal Section, R. H. C. Balliet, secretary, 30 Vesey Street, New York, N. Y. This section, by recommendation, harmonizes and coordinates the principles and practices of American railroads, and revises and keeps up to date the drawings and specifications contained in its Manual of Recommended Practices, with respect to the design, construction, maintenance, and operation of railway signaling devices. During the past year it approved the adoption and, in some cases, revisions of the following specifications and recommended practices: Installation, maintenance, and operation of nickel, iron, alkaline, and lead acid type storage batteries; maintaining and testing interlocking plants; centralized traffic control system; automatic block signal system; interlocking system; installation of electric interlocking; power interlocking machine; electropneumatic switch operating mechanism; air-cooled reactor for line and track circuits impedance bond; alternating current generator; direct current generator; direct current automatic block signaling circuits; tractive armature direct current neutral relay for series line approach lighting; varnish treatment of electrical windings; impreg-



nating compound treatment of electrical windings; galvanized E. B. B. steel bonding wires; 40 per cent conductivity copper-covered steel bonding wires; telegraph and telephone and other communication wires and cables crossing the tracks of steam and electrified railroads; rubber insulating tape; aerial braided cable; armored submarine cable; lead-covered cable; mineral matter rubber compound insulated signal wire; and parkway cable. This section has also prepared a set of conclusions and findings recommending the use of automatic interlockings and block signals, car retarders, electric lighting of signal and switch lamps, grade or tonnage signals, manually-operated interlockings, etc. These are being considered as economy moves for reducing operating expenses.

American Railway Association, Telegraph and Telephone Section, W. A. Fairbanks, secretary, 30 Vesey Street, New York, N. Y. This section functions as a part of the operating division of the American Railway Association. In its loose-leaf manual for use by supervisory engineering and field forces are included 236 recommended specifications and practices for the advancement of efficiency of the telegraph and telephone departments of the railroad service and the standardization of the plant, equipment, and practices. Numerous standing committees are actively engaged in formulating new practices or in revising existing ones. The following important subjects are now being considered by committees of this section: Communication transmission, radio and wire carrier systems, electrical protection, message traffic, economics, inductive interference, inside and outside plant, protection against electrolysis, accident and fire prevention, first aid, and education and training of employees.

American Railway Association, Transportation Division, G. W. Covert, secretary, 59 East Van Buren Street, Chicago, Ill. The duty of this division is to formulate rules covering, and report upon questions affecting, the uniform and efficient use and interchange of equipment. Its activities include the formulation, revision, and interpretation of the following rules: Code of car-service rules, code of per diem rules, code of switching reclaim rules, embargo regulations, national car-demurrage rules, uniform code of storage rules, national track-storage rules, regulations for the handling of railroad business mail, mileage allowances and rules governing the handling, also the

payment of mileage, and the equalization of mileage on cars of private ownership, methods for loading carload freight, rules governing loading, stowing, and handling of carload and less-than-carload freight, rules governing the application, inspection, recording, and care of car seals, assignment of permanent reporting marks for use on cars of railroad and private ownership, supervision of checks to establish terminal-switching reclaim allowances.

American Railway Engineering Association, E. H. Fritch, secretary, 59 East Van Buren Street, Chicago, Ill. At its annual meeting held during the past year this association approved revisions of and, in some cases, supplements to material appearing in its Manual of Recommended Practice relating to the following subjects: Specifications for concrete fence posts; roadbed drainage; protection of roadbed and bridges from washouts and floods; specifications for stone ballast; plans for switches, frogs, crossings, slip switches, etc.; plans and specifications for track tools; Portland cement concrete, plain and reinforced; highway crossing signs and signals; rules for maintenance of bridges—steel structure; revision of standard methods of water analysis and interpretation of results; specifications for salt to be used in regeneration of zeolite water softening plants; revision of standard method for the determination of the specific gravity of creosote fractions; and specifications covering the several types of river bank protection and levees in common use. A committee of this association is cooperating with other committees and organizations concerned in the standardization and simplification of store stock and the disposition of materials reaching obsolescence. Several other committees are engaged in standardizing valves and packing for water service pumps, parts, and accessories for railway maintenance motor cars.

American Refractories Institute, Stuart M. Phelps, director of research and tests, Mellon Institute, Pittsburgh, Pa. This organization has formulated and adopted specifications for clay fire brick for malleable furnaces with removable bungs and for annealing ovens, and also specifications for fire clay brick for marine boiler service. At the present time it is cooperating with various national bodies in standardizing specifications and tests for refractories.

American Road Builders' Association, Charles M. Upham, secretary, Na-

tional Press Building, Washington, D. C. During the past year a joint committee composed of representatives of this association and the American Association of State Highway Officials prepared a report on the standardization of blades for truck scrapers. Several other technical reports prepared by committees within the past year deal with the following subjects: Concrete pavements; equipment for spreading and finishing bituminous pavement surfaces; practical developments in the design and construction of reinforced concrete pavements, bases, and brick pavements; standardization of weighing devices for concrete aggregate, and steel side forms for concrete pavements; standard methods of promoting county bond issues; and equipment for construction and maintenance of low-cost road surfaces.

American Society of Bakery Engineers, Victor E. Marx, secretary; W. W. Reece, chairman, standardization committee, 1541 Birchwood Avenue, Chicago, Ill. The standardization committee of this society, working in cooperation with manufacturers of air-conditioning equipment, formulated certain standards relating to humidifier practice in baking plants which were approved at the 1932 annual meeting of the society. The committee is now devoting considerable time in working out with air-conditioning-equipment manufacturers the standards which it has recommended and is also cooperating with the baking industry for the purpose of acquainting the users with this equipment and practices.

American Society of Civil Engineers, George T. Seabury, secretary, 33 West Thirty-ninth Street, New York, N. Y. Standardization work of the society is conducted through the appointment of committees to deal with certain projects and through representation on committees of other organizations. Research committees have been organized to carry on work relating to stresses in railroad track, irrigation hydraulics, concrete and reinforced concrete arches, steel columns, cement, earths and foundations, dams, and meteorological data. Special committees are also maintained by nine of the technical divisions of the society, studying the fields of city planning, construction, engineering economics and finance, irrigation, power, sanitary engineering, structural engineering, surveying and mapping, and waterways. The society is officially represented on the Joint Committee on Concrete and Reinforced Concrete.

In cooperation with the American Public Health Association, it has adopted standard definitions of terms used in sewerage and sewage-disposal practice. The society is joint sponsor for two ASA sectional committees on manhole frames and covers and on scientific and engineering symbols and abbreviations.

American Society of Heating and Ventilating Engineers, A. V. Hutchinson, secretary, 51 Madison Avenue, New York, N. Y. Ten years' work by this society in the field of standardization has resulted in the formulation and adoption of the following standard test codes: Testing and rating steam-unit ventilators; testing and rating concealed gravity-type radiation; testing steam-heating boilers burning oil fuel; rating steam-heating solid-fuel hand-fired boilers; testing and rating steam-unit heaters; heating and ventilating garages; steam-heating solid-fuel boilers (3); standard and short form heat balance codes for testing low-pressure steam-heating solid-fuel boilers (1 and 2); testing radiators; heat transmission through walls; disk and propeller fans, centrifugal fans and blowers; and code of minimum requirements for the ventilation of buildings. During the past year the society adopted standard codes on ventilation requirements which were prepared by its committee on ventilation standards. In addition to its own codes, the society has cooperated with other organizations in the development of standard ordinance for chimney construction; identification of piping systems, and standard code regulating the installation of gravity warm-air furnaces in residences. These codes have also been adopted by the society. Through its committee on research the society carries out its research program at its own laboratory located at the Bureau of Mines Experiment Station, Pittsburgh, Pa., and at 10 universities in different parts of the country. The research work of the society has been particularly effective in establishing standards for calculating heat losses of buildings; determining accurate piping systems for steam and hot-water heating; establishment of the effective temperature scale showing the relation of temperature, humidity, and air motion to sensations of warmth; development of the so-called comfort charts for summer and winter conditions; heat and moisture data for human beings at work and at rest.

American Society of Mechanical Engineers, Calvin W. Rice, secretary, 29



West Thirty-ninth Street, New York, N. Y. The society has 16 professional divisions each of which has a section of the society's Transactions in which are published for reference purposes worthwhile technical papers with discussions. The technical-committee activities of the society have grown very rapidly during the past 13 years, until now approximately 1,865 engineers and others are serving on the 436 committees for which the society is sponsor or joint sponsor. In this work 222 organizations cooperate. Under the main research committee 27 special committees are engaged in cooperative research. At the present time some 35 research workers are engaged on a variety of projects. Seven research fellows at the Bureau of Standards are working on the experimental program of the research committees. A section of the society's Transactions, to be known as Research Papers, which will include reports and papers resulting from the experimental programs of the research committees, is being published. The dimensional standardization and safety activities of the society are carried forward under the procedure of the American Standards Association. The society is sponsor or joint sponsor for 30 sectional committees on standards and 5 sectional committees preparing safety codes. One of these committees deals with standardization activities recently inaugurated, namely, classification and designation of surface qualities. One of the society's most notable technical committee accomplishments is the development of the American Society of Mechanical Engineers' Boiler Construction Code, consisting of eight sections and interpretations, which has been officially adopted by 19 States and 16 cities in this country. The preparation of the society's standard tests of power plant and heat apparatus is in the hands of a group of 20 committees guided by the main committee on power-test codes. The society has published in pamphlet form 43 dimensional standards, 2 safety codes, 5 research reports, 6 bibliographies, and 20 power-test codes. The society's standardization committee plans to make a canvass of the extent of the adoption of a given standard on the second, third, and fourth anniversaries of its approval by the American Standards Association. In its mechanical catalogue special notations are employed to indicate those firms supplying equipment

in conformity with standards approved by the American Standards Association.

American Society of Municipal Engineers, C. W. S. Sammelman, executive director, 4359 Lindell Boulevard, St. Louis, Mo. Standardization activities of this organization are conducted by specifications committees dealing with the following subjects: Sewers; sub-grade and foundations; sidewalks and curbs; bituminous, brick, cement and concrete, and stone-block pavement; street-railway pavement and track construction; and municipal-contract form. To date the society has approved and adopted more than 20 standard specifications relating to the above-mentioned subjects. These specifications are kept in harmony with those issued by the American Society for Testing Materials. It is officially represented on nine sectional committees functioning under the procedure of the American Standards Association.

American Society of Refrigerating Engineers, David L. Fiske, executive secretary, 37 West Thirty-ninth Street, New York, N. Y. This society has formulated and adopted standard test codes for refrigerators, corrosion prevention, refrigerating systems, and steam-driven ice plants, and specifications for synchronous motors for direct-connected refrigerating compressors. It publishes a biennial bound Refrigerating Data Book in which are included all codes and standards of the field. It is serving as sponsor for the ASA sectional committee on safety code for mechanical refrigeration, and joint sponsor for the sectional committee on standards and specifications for refrigerators. A committee of the society is continuing its studies in connection with the so-called standard ton relating to standard measurement for commercial-size refrigerating-machine performance.

American Society of Safety Engineers, engineering division of the National Safety Council. (See National Safety Council, p. 217.)

American Society of Sanitary Engineering, Thomas M. Dugan, president, 1308 Freemont Street, McKeesport, Pa.; James R. Walker, secretary, City Hall, Waterbury, Conn. This society is cosponsor with the American Society of Mechanical Engineers for the American Standards Association sectional committee on the standardization of plumbing equipment. It is officially represented on other ASA

sectional committees dealing with standardization of hose couplings and industrial safety standards. Through its research committee it is carrying on studies along a number of lines in the field of mechanical sanitation. These studies, when brought to a conclusion, will be developed into a tentative standard, and as such referred to the sanitary standards committee or to the American Standards Association for further consideration.

American Society for Steel Treating, W. H. Eisenman, secretary, 7016 Euclid Avenue, Cleveland, Ohio. Several committees of this society are now engaged in developing recommended practices on the following subjects: Forging carbon and alloy steels; gas carburizing; hardness testing of metals; heat treatment of carbon-steel gears; heat treatment of springs; heat-resisting alloys; heat treatment of tool steels; definitions of heat-treatment terms; machinability of steels; melting of steel; nitriding; pickling of iron and steel; plastic deformation in pure iron; quenching media, practice and equipment; and testing and inspecting of threaded sections.

American Society for Testing Materials. (See Ch. VIII, p. 167.)

American Standards Association. (See Ch. VIII, p. 164.)

American Transit Association, G. C. Hecker, general secretary, 292 Madison Avenue, New York, N. Y. This association was formerly known as the American Electric Railway Association. During the past year 34 committees of the several divisions of this association were engaged in research, and have submitted reports for consideration by the association, of which 23 are concerned with the formulation or revision of standards and specifications. Special joint work with other national organizations was conducted on the subjects of trolley-wire design and specifications and on the matter of clearances for overhead working conductors in heavy traction service. Through a heavy electric traction committee, standards for rail bonds were prepared. Committees of the power division submitted standards for: Wood poles, two classes of underground cable, and trolley bus overhead construction. In the purchases and stores division, schedules of standard packaging for railway controller and motor parts and for railway bonds and bond terminals and certain selected overhead-line material were prepared (in cooperation with the division of simplified practice

of the Bureau of Standards). In the rolling-stock division, the standardization of motor-coach design and construction has been studied; further progress has been made on the standardization of various maintenance practices connected with motor-coach operation; lighting practice for street cars, motor coaches, shops, office, and yard was further developed and standardized and recommended practice in the lighting of trolley buses was prepared; the standards for journal boxes, journal bearings, brake shoes, and limits of wear were revised to bring them in accord with modern practice; the study of roller bearings for cars and new types of current-collecting devices for cars and trolley buses continued; revised regulations for the wiring of trolley buses and of storage sheds for trolley buses were submitted; and there was also continued the joint work with the steam-railroad groups on the preparation of designs for large-size drive axles. In the way and structure division, further revision and standardization was carried on for the following items: Tie rods, rail sections and associated splice bars, wheel and rail contours; welding rods; branding of rails; track and pavement construction; and foundations for special track work. During the past year the 1932 supplement to the Engineering Manual of the association was issued to bring the 1929 edition of this manual up to date. The association is a member of the American Standards Association and through it takes active part in the consideration of all standards and specifications affecting the electric-railway industry. It is represented on the electrical standards committee of that body. It has submitted to the American Standards Association a number of standards which have been approved by that body, and it is sponsor or joint sponsor for 13 projects.

American Veterinary Medical Association, Dr. H. Preston Hoskins, secretary-editor, 1230 West Washington Boulevard, Chicago, Ill. An important function of this association in standardization matters is the work of the committee on veterinary biological products. This committee is endeavoring to bring about a standard classification, including nomenclature, of all biological products that are now in use for the purpose of preventing or curing diseases of animals. It is planned to classify these products on the basis of acceptability to the association.

American Vitrified China Association, E. K. Koos, secretary, care of D. E.



McNicol Pottery Co., Clarksburg, W. Va. This association cooperated with other units of industry in the establishment of a limited number of standard sizes and varieties of hospital plumbing fixtures, hotel, cafeteria, restaurant, hospital, and dining-car chinaware.

American Warehousemen's Association, Cold Storage Division. Name changed to Association of Refrigerated Warehouses. (See p. 194.)

American Water Works Association, 29 West Thirty-ninth Street, New York, N. Y. Malcolm Pirnie, chairman; A. V. Ruggles, secretary, committee on water-works practice. In the Manual of Water Works Practice prepared and issued by this association are included the following standards and specifications: Cast-iron pipe and special castings; hydrants and valves; cold-water meters, disk type; displacement, current, compound and fire-service meters; chemicals used in water purification; pressure water filters; sanitary drinking fountains; mechanical analysis of sand and gravel; and agreement for engineering construction. Its committee on water-works practice is at the present time revising the specifications for steel standpipes and elevated tanks. The specification for cement mortar lining for cast-iron pipe prepared by ASA sectional committee on specifications for cast-iron pipe and special castings, of which this association is one of the sponsors, is now before the other sponsor bodies for consideration and approval as an American Tentative Standard. In addition to the above-mentioned committee, this association is also joint sponsor for the ASA sectional committee on screw threads for fire-hose couplings.

American Welding Society, M. M. Kelly, secretary, 33 West Thirty-ninth Street, New York, N. Y. Several committees of the society are cooperating with the boiler code committee of the American Society of Mechanical Engineers in the promulgation of proper rules and regulations governing the use of welding of unfired pressure vessels and boiler drums. A second edition of the code relating to fusion welding and gas cutting in building construction which was issued by the society several years ago was published in 1930. The committee on building codes has under preparation several sections on welded piping and tankage. A committee is cooperating with the ASA pressure piping committee in the preparation of a welding code for pressure piping. The society

has appointed a committee to prepare a code or set of specifications covering the fundamentals of design for conversion of machine-tool electrical equipment and other mechanical parts now made from conventional castings to welded steel. The committee on welding in marine construction has prepared a code for fusion welding and gas cutting in marine construction part B, covering rules for the construction of fusion welded marine boilers and pressure vessels. The committee, and its subcommittees on marine boilers and hull construction, have under preparation rules for the repair of marine boilers and pressure vessels; rules for the construction of fusion-welded hulls and hull parts; rules for the repair of hulls by fusion welding, and rules for fusion-welded marine piping installations. The society is officially represented on six sectional committees of the American Standards Association.

American Wood Preservers' Association, Horace L. Dawson, secretary, 1427 I Street NW., Washington, D. C. Listed in its Manual of Recommended Practice are 44 standards and specifications dealing with preservative treatments of wood which have been formulated and adopted by this association. In 1932 this association adopted a revised standard covering preservative treatment of pole butts by the nonpressure process (incising method) and a glossary of terms used in wood preservation. The association has also set up tentative revisions of its standards dealing with the following subjects: Distillation of creosote oil, method for the determination of the amount of material insoluble in benzol, specifications for creosote oil for ties and structural timber, specifications for creosote-coal-tar solution for ties and structural timber, specification for water-gas-tar distillate for use with zinc chloride, specification for water-gas-tar solution for use with zinc chloride, volume and specific gravity factors for creosote oil, creosote-coal-tar solution, and coal tar.

American Zinc Institute, Julian D. Conover, secretary, 60 East Forty-second Street, New York, N. Y. This institute is joint sponsor with the American Society for Testing Materials, for the sectional committee on zinc and zinc ores, functioning under American Standards Association procedure. During the past year the institute has continued its campaign to enlarge the use of galvanized sheets by the adoption of a "seal of quality" to be stenciled on sheets of specified weights of zinc

coating. All licensed manufacturers whose heavy-coated galvanized roofing sheets comply with the standard thickness of zinc coating or weight recommended by the institute are permitted to use the seal on such products. In addition to the seal, there appears also on every sheet either the brand and trade-mark or the name of the manufacturer, thus giving double assurance of quality. Sheets bearing the quality label are rigidly tested and inspected to insure exceptional quality.

Anthracite Institute, Gen. Brice P. Disque, executive director, 19 Rector Street, New York, N. Y.; Edward W. Parker, secretary, 225 South Fifteenth Street, Philadelphia, Pa. The institute has recently revised its standard anthracite specifications covering screen-grading limits for broken, egg, stove, nut, pea, buck, rice, and barley sizes of anthracite coal, with maximum permissible impurities in each grade. It maintains a laboratory for the approval of coal-using equipment and from time to time issues a list of approved devices including space heaters, vacuum cleaners, blower systems, domestic stokers, and thermostatic equipment.

Arkansas Soft Pine Bureau, L. J. Arnold, secretary, Little Rock, Ark. This association took an active part in the formulation and promulgation of American lumber standards conducted under the auspices of the Central Committee on Lumber Standards and published by the United States Department of Commerce. The standard specifications for grades of Arkansas soft-pine lumber issued by this association conform to the American lumber standards. The bureau now has in effect a plan whereby all lumber shipped by its member mills is trade-marked with the registered symbol of the bureau. All stock of the member mills is also grade marked in accordance with American lumber standards sizes and grades for softwood lumber.

Aromatic Red Cedar Closet Lining Association, H. B. Weiss, chairman, care of George C. Brown & Co., Memphis, Tenn. This organization initiated the movement for the establishment of standard dimensions, quality, and red-heart content for aromatic red-cedar closet lining set forth in the commercial standard published by the Department of Commerce. The association recommends to its members the use of a label guaranteeing that red-cedar closet lining supplied by them conforms to the standard grading

rules given in the above-mentioned commercial standard.

Asbestos Bureau (Inc.), J. W. Clise, jr., secretary, 234 Securities Building, Seattle, Wash. A standard code has been adopted by this bureau for the purpose of covering the better standard practices of workmanship and materials in the asbestos insulating field and designed to be used in connection with nonconducting covering specifications. This organization operates a certification plan based largely on the one being advocated by the Bureau of Standards, by which it certifies to the building owner that the insulation installed in his building is in accordance with the specifications called for in the contract. All certificates issued by this bureau are accompanied by a bond from a national surety company. At the present time the bureau is developing a series of standard specifications to be used as guides by architects in determining what thickness, type, or quality of insulation they wish to use on a particular job.

Ash Handle Association, G. B. Durell, president, 1910 Keith Building, Cleveland, Ohio. This organization sponsored the movement for the establishment of standard grades of ash handles which resulted in the adoption by the industry of Simplified Practice Recommendation R76. Manufacturers of ash handles are encouraged to impress the symbol of the grade in the wood of the handle in accordance with the grades specified in the recommendation.

Asphalt Institute, J. E. Pennybacker, managing director, 801 Second Avenue, New York, N. Y. This organization has formally adopted seven construction specifications for various types of asphalt pavement wearing courses and foundations and seven specifications for liquid asphaltic products as follows: Asphalt macadam surface course; asphaltic concrete surface course (coarse-graded aggregate type); asphaltic concrete surface course (fine-graded aggregate type); sheet asphalt binder and surface courses; asphaltic concrete binder and surface courses; asphalt macadam base; asphaltic concrete base; asphaltic road materials Nos. 1, 2, 3, 4, 5, 6, and 7. The institute cooperates with various governmental and technical organizations in developing methods of tests and specifications for asphaltic products for highway, roofing, and waterproofing purposes.

Asphalt Shingle and Roofing Institute, J. S. Bryant, manager, 2 West Forty-fifth Street, New York, N. Y. The in-



stitute has adopted granular-metric specifications for red, green, and blue-black slate; methods of test for other raw materials as well as finished-roofing products, including a formula relative to the saturation point of felt used in manufacturing shingles. Its entire membership adopted a resolution whereby it unanimously signified its willingness to certify to purchasers that commodities supplied by them on contracts based on Federal specifications have been tested and found to comply with the requirements of these specifications. The institute maintains one research associate at the Bureau of Standards conducting research on durability of felt fibers.

Associated Cooprage Industries of America, Louis F. Horn, secretary, 411 Olive Street, St. Louis, Mo. Working in cooperation with industry and the Bureau of Standards, this organization initiated the movement for the establishment of the simplified-practice recommendation covering standard dimensions of butter tubs. It also developed a classification of tight barrels and kegs, which includes standards of capacities, dimensions, grades of material, specifications, lists of purposes for which each barrel is suitable, and linings to be used on barrels according to the commodities to be packed therein. During the past year it also adopted revised grade rules and specifications for tight-barrel staves and heading, and for slack-barrel staves, heading, and hoops. The association cooperates with the Bureau of Explosives in the revision of specifications for slack and tight barrels and kegs for the transportation of dangerous articles by rail; also with the Freight Container Bureau of the American Railway Association and with the several classification committees in the formulation of standard specifications for slack barrels for fruits, potatoes and other vegetables.

Associated Factory Mutual Fire Insurance Companies, Inspection Department, C. W. Mowry, manager, 184 High Street, Boston, Mass. The inspection department of this association of 26 mutual fire-insurance companies serving large industrial plants in the United States and Canada, tests and approves fire-protective and electrical equipment. Manufacturers of approved appliances are listed in the pamphlet, *Approved Fire Protective and Electrical Equipment*, and are permitted to use the symbol F. M. on devices which have received approval. The inspection department also formulates standard specifications for some

of the appliances, writes standard installation rules, and publishes pamphlets giving information on safeguards for special hazards and suggestions of building construction features. This association is a member of the fire-protection group of the American Standards Association and is active in the affairs of the 15 sectional committees of that organization dealing with safety codes and materials and equipment for fire fighting. Through committee representation, the association also cooperates in the standardization activities of the National Fire Protection Association, the American Society of Mechanical Engineers, the American Society for Testing Materials, and other similar organizations.

Associated General Contractors of America (Inc.), Edward J. Harding, managing director, Munsey Building, Washington, D. C. This association adopted the American Institute of Architects' form for the construction of buildings and has participated in the development of standard contracts for engineering and municipal construction and in the development of standard questionnaires for bidders and for credit transactions. It developed and approved a number of standards, including equipment ownership expense schedule, cost plus a fee contract form, and various estimating forms. Through its Mixer Manufacturers Bureau the association continues to maintain its size and capacity standards for concrete mixers and pavers. The Contractors Pump Manufacturers Bureau of the association has adopted standards for high-pressure road pumps and for diaphragm pumps and centrifugal pumps used on construction work. Brass rating plates are issued by the association for attachment to machines conforming to the association standards. It maintains representation on seven ASA sectional committees.

Associated Knit Underwear Manufacturers of America, Roy A. Cheney, secretary, Union Station Building, Utica, N. Y. This association has adopted a standard method of testing the breaking strength of knitted fabrics and washing instructions for knit rayon underwear and knit wool and wool-cotton underwear. A committee of the association is cooperating with the Federal Specifications Board in developing knit underwear specifications for Government purchases. The association is also cooperating with the Bureau of Aeronautics of the United States Navy Department in developing

suitable specifications for underwear to be used by aviators for winter flying and for high altitudes. The chief project of the association has been the development of standard sizes, measurements, and methods of measuring for the various types of knit underwear. It cooperated with the Bureau of Standards in the establishment of a commercial standard for regain of mercerized cotton yarns, and for boys' blouses, waists, shirts, and junior shirts. It has adopted five sizes of boxes as standard for packing all types of men's and boys' knit underwear. The association has also adopted a standard mark for use by manufacturers, under license from the association, on garments made to measurements certified to conform to tables appearing in Commercial Standard CS33-32. A committee composed of jobbers, retailers, and manufacturers has the right to revoke the license upon proof that the use of the standard mark has been knowingly and wilfully abused.

Associated Manufacturers of Water Purifying Equipment, Arthur M. Crane, secretary, P. O. Box 307, Gary, Ind. This association formulated and adopted standard specifications for pressure water filters in which are embodied the best practice for rates and features of construction for pressure filters. These specifications, which have been incorporated in full in the Manual of Water Works Practice of the American Water Works Association, include standard capacities of vertical and horizontal filters, required thickness of shell for various sizes, and working pressures for steel and cast-iron filters.

Associated Tile Manufacturers, H. L. Gaardsmoe, secretary, 420 Lexington Avenue, New York, N. Y. This organization prepared and issued publications relating to basic specifications for tile work and standard shapes of glazed tiles and trimmers. It sponsored the movement for the establishment of standard sizes of clay tiles for floors and walls, which resulted in the formulation of the simplified-practice recommendation under the auspices of the Bureau of Standards. During the past year the association adopted 56 wall-tile trimmers as standards for the tile industry. These include various types of cap and base, complementary angles, corners, and stops, and are designed to care for every normal trimmer requirement. In order to assure purchasers of uniform quality and grade of tiles, this organization has adopted standard

grade names and a color scheme for grade marking and grade sealing of packages of various types of tiles manufactured to comply with the simplified-practice recommendation covering clay tiles for floors and walls.

Association of American Feed Control Officials, L. E. Bopst, secretary-treasurer, College Park, Md. This association has adopted standard definitions of feeding stuffs for the following products: Alfalfa, animal, apple, barley, brewers' and distillers', buckwheat, corn, cottonseed, linseed and flax, marine, milk, oat, peanut, rice, rye, velvet bean, wheat, and mineral feed. It has also adopted tentative definitions for milk and marine products and fish oils. The association has now under discussion for adoption definitions relating to oat flour and elevator cleanings. It has adopted uniform types of labels for all classes of feeds. Manufacturers or jobbers are required to place labels on all packages of feeds, and the registration of brands and guaranties must be filed with each State-control agency. A guaranty and label for a brand having been registered may not be subsequently so modified as to permit the lowering of the quality of the feed, unless it can be clearly shown that the modification sought to be made is consistent with the interest of the feeder. The control organization may cancel the registration of any feed when it has been found that the brand name is misleading in any respect, or the feed contains an injurious ingredient, or packages are incorrectly labeled with regard to ingredients, or there is evidence of misbranding or adulteration, or when labels on packages contain any statement, design, or device which tends to deceive the purchaser.

Association of American Soap and Glycerine Producers (Inc.), Roscoe C. Edlund, manager, 45 East Seventeenth Street, New York, N. Y. The standardization activities of this organization are conducted by its glycerine group under the direction of the Glycerine Producers' Association, one of the parts of the Association of American Soap and Glycerine Producers (Inc.). (See p. 199.)

Association of American Steel Manufacturers Technical Committees, J. O. Leech, secretary, 616 Investment Building, Pittsburgh, Pa. Standards issued by this association include specifications for structural and boiler steel, concrete reinforcement bars, commercial and special forging quality bar steels, steel tie plates, tubes and pipe of both plain carbon and 4-6 per cent



chromium steel for gasoline-cracking stills. It has also issued standard practices covering allowable variations in size and weight of hot-rolled bars, gage weight, gage thickness, size, and flatness of sheets and light plates. This association cooperates with the American Society for Testing Materials, American Standards Association, and other organizations in the establishment of standards for steel practice.

Association of American Wood Pulp Importers, Orvar Hylin, president, 52 Vanderbilt Avenue, New York, N. Y. Official rules relating to the weighing, sampling, and testing of wood pulp for moisture have been formally approved and adopted by this association.

Association of Edison Illuminating Companies, Preston S. Millar, secretary, Eightieth Street and East End Avenue, New York, N. Y. This association sponsors the quality improvement program for the purpose of bringing about improvements in the operating characteristics of domestic electrical equipment sold to the public. The work is under the direction of the association's appliance committee, which has employed the Electrical Testing Laboratories to serve as its technical agent. In accordance with this program the qualities of performance of all brands, makes, and models of electrical equipment within each class are determined, and the findings are reported to electric-service companies sponsoring the work for private use in their purchases and promotional activities. Findings are also reported to individual manufacturers, in the case of their own products, and adverse indications are privately discussed with each of them. In connection with this work the committee has developed safety requirements for customers' electrical equipment, including test requirements for electrical insulation. It has also developed quality specifications for many kinds of domestic electrical equipment, including flat-irons, ranges, toasters, and water heaters. The association, ever since 1896, has engaged in organized testing of incandescent electric lamps, the result of which is to set very high standards for the quality of such products as are purchased by its member companies for their own use or for sale to the public. In cooperation with the Illuminating Engineering Society, this association prepared specifications for residence-lighting luminaires.

Association of Electragists, International, Laurence W. Davis, general manager, 420 Lexington Avenue, New

York, N. Y. This organization has developed the electragist standards for wiring installations, covering types of wiring required under given conditions, specifications for materials and apparatus and their installation, and general requirements for services, grounding, etc. A new section of these standards prepared in 1931 and revised in 1932 covers engineering design of residence wiring adequacy, with recommended form of architects' specifications for same. The association is joint sponsor for the ASA sectional committee on symbols for electrical equipment of buildings.

Association of Governmental Officials in Industry of the United States and Canada, E. B. Patton, president, Bureau of Statistics and Information, Department of Labor, 80 Centre Street, New York, N. Y. This organization does not of itself develop standards for industry. It does, however, cooperate with the American Standards Association in the selection of members to serve on sectional committees for the drafting of safety codes. At the present time this association is officially represented on ASA sectional committees engaged in the development of 21 safety code projects. It maintains a standing committee whose duty it is to report annually concerning the methods of preparing safety codes in the various States of the Union and in the several Provinces of Canada.

Association of Iron and Steel Electrical Engineers, John F. Kelly, managing director, Empire Building, Pittsburgh, Pa. Standards, specifications, and codes formulated and adopted by this association include electric overhead traveling cranes, heavy-duty steel mill service; guide forms, steel-mill auxiliary control, a. c. motors for main roll drives; commutating-pole mill-type motors; engine stops; 40-inch blooming-mill drives; and rules for the safe operation of traveling cranes. The association has prepared reports covering standard practices in connection with the type of lubrication and method of application to all types of equipment and apparatus used in the iron and steel industry; standardized operation and maintenance of electric overhead traveling cranes; standardized method for the organization and operation of an electrical engineering and maintenance department; uniform methods of measuring fuel efficiencies, both for heating furnaces and boilers; a preliminary report on the standardization of control apparatus for open-hearth furnaces; and a report showing

the location, horsepower, and electrical characteristics of every motor 300 horsepower and over installed on main roll drives in the iron and steel industry in the United States and Canada. It has also prepared reports, charts, data, indicating the electrical developments in the iron and steel industry for 25 years. The association has also prepared preliminary reports relating to the application of antifriction bearings, mill-type motors, cranes, and roll necks; standardized full magnetic direct current controllers for use in steel mills; safety regulations necessary when working on high-tension lines; and the life of wire rope used on ladle cranes in the iron and steel industry. The association is continuing its work in the formulation of standard specifications for ordering reduction gear sets, gears, and pinions.

Association of Official Agricultural Chemists, W. W. Skinner, secretary, Box 290, Pennsylvania Avenue Station, Washington, D. C. This association cooperates with the American Public Health Association in the preparation of standard methods of milk analysis, and with the committee on revision of the United States Pharmacopœia on methods of testing drugs and medicinal products. It has issued a publication entitled "Official and Tentative Methods of Analysis of the Association of Official Agricultural Chemists" in which appear the standard methods of analysis for agricultural products and other materials used in the agricultural industry which have been formulated and adopted by this association. The standards and tentative methods of physical and chemical analysis cover a wide range of agricultural products.

Association of Official Seed Analysts of North America, F. S. Holmes, secretary, College Park, Md. This association has adopted rules covering standard methods of sampling, purity analysis, and germination tests which are published by the United States Department of Agriculture as Department Circular 406 entitled "Rules for Seed Testing." The research committee continued its reference work during the past year with particular attention to germination testing with a view to having the association's laboratories adhere more closely to soil tests as an ultimate guide in evaluating germination tests.

Association of Pyroxylin Coated Fabric Manufacturers, now Institute of Leather Cloth and Lacquered Fabrics Manufacturers. (See p. 202.)

Association of Railway Electrical Engineers, J. A. Andreucetti, secretary, Chicago & Northwestern Terminal Station, Chicago, Ill. Standards covering the electrical equipment of rolling stock, railway yards, and power plants, of steam railways have been published by this association in its Manual of Recommended Practice. The association is officially represented on five ASA sectional committees dealing with electrical projects.

Association of Refrigerated Warehouses, W. M. O'Keefe, executive secretary, 222 West Adams Street, Chicago, Ill. This organization, formerly known as the cold-storage division, American Warehousemen's Association, took an active part in the establishment of the simplified practice recommendation for warehouse forms promulgated by the Department of Commerce.

Better Bedding Alliance of America, S. J. Mills, secretary, 608 South Dearborn Street, Chicago, Ill. During the past year this organization cooperated with the Bureau of Standards in an effort to revise the simplified practice recommendation relating to sizes of beds, springs, and mattresses. The alliance secured the approval of the pillow manufacturers and the feather and down industry to adopt certain standards and specifications of practice relative to pillows and other feather and down products. This organization has inaugurated a labeling program whereby manufacturers who have definitely pledged themselves in writing to observe the bedding laws of the States in which they manufacture or sell and to maintain a high standard of fairness in business, are permitted to use the emblem recommended by the alliance as a distinguishing mark of both the quality of the product and the integrity of the manufacturer. Any proved violation of the pledges warrants revoking of the right to use the emblem.

Binders Board Manufacturers Association, C. L. Lloyd, secretary, 370 Lexington Avenue, New York, N. Y. Under the auspices of the division of simplified practice of the Bureau of Standards this association initiated the movement for simplification of sizes for binders board which resulted in the establishment of 10 standard sizes set forth in the simplified practice recommendation published by the Department of Commerce. In cooperation with the Bureau of Standards it developed minimum standard specifications for binders board which have



been promulgated by the association to the trade.

**Building Officials' Conference of America**, John W. Oehmann, secretary, 1253 Lawrence Street NE., Washington, D. C. This organization cooperates with the Building Code Committee of the United States Department of Commerce in the formulation of standard building codes for adoption by municipalities and States. Through official committee representation it also cooperates with other bodies, under the procedure of the American Standards Association, in work relating to building construction and materials.

**Bureau of Explosives**, Col. B. W. Dunn, chief inspector, 30 Vesey Street, New York, N. Y. One of the chief functions of this bureau is to revise and keep up to date for submission and approval of the Interstate Commerce Commission rules and regulations for the transportation of explosives and other dangerous articles and also specifications for shipping containers. The bureau's test and specification department cooperates with associations and industries in the investigation and formulation of new types of shipping containers. A chemical laboratory is maintained by the bureau for making studies of explosives, other dangerous articles, and containers, and a force of traveling inspectors for the purpose of insuring compliance with the requirements of the regulations and specifications of the Interstate Commerce Commission relating to the transportation of explosives and other dangerous articles.

**California Fruit Growers Exchange**, F. O. Wallschlaeger, assistant secretary, P. O. Box 530, Station C, Los Angeles, Calif. During the past year this organization revised its specifications for the various grades of fruit and also its rules and regulations governing fruit packed and sold under its trade-marks. The exchange has adopted certain rules which must be complied with in order to permit the use of its trade-marks on oranges, lemons, and grapefruit.

**California Redwood Association**, C. H. Griggen, general manager; J. W. Williams, secretary, 405 Montgomery Street, San Francisco, Calif. Standards and specifications for eastern and western California redwood grades complying with American lumber standards have been issued by this association. It is continuing its cooperation with manufacturers of other west coast woods on a program for the standardization of patterns and sizes of moldings. This association has es-

tablished a department of inspection and grades through which the association supervises the grades of all redwood lumber manufactured by its member mills. Shipments which have been inspected are covered by inspection service bearing the official seal and signature of the association.

**Canners League of California**, Preston McKinney, vice president, 215 Market Street, San Francisco, Calif. Standard grade definitions, including requirements on sugar strength of sirup, for 5 grades of canned apricots, pears, peaches, sliced peaches, muscat grapes, cherries, plums, 1 grade of canned prunes, and 2 grades of fruits for salad have been adopted by the league. The principal standardization activity carried on by this organization during the past year has been in connection with the revision of the standards provided for in the McNary-Mapes amendment to the Federal food and drugs act. The wording now required on the labels of substandard canned fruits is "Below U. S. Standard—Good Food—Not High Grade." Special wording is provided for certain exceptions. The wording for substandard canned peas and canned tomatoes remains the same, namely, "Below U. S. Standard—Low Quality—Not Illegal."

**Canning Machinery and Supplies Association**, S. G. Gorsline, secretary, 549 West Randolph Street, Chicago, Ill. This organization cooperates, for the benefit of its members, with several organizations in standardization work. It cooperates with the Glass Container Association of America and the National Canners' Association in the standardization and simplification of glass containers and with box-board manufacturers in the standardization of canned food containers. The association is officially represented on the ASA sectional committee on tolerances and gages for metal fits.

**Cast Iron Pipe Research Association**, Thomas F. Wolfe, research engineer, 122 South Michigan Avenue, Chicago, Ill. A committee of this association is continuing its work in cooperation with the American Gas Association for the purpose of developing information on mechanical joints for cast-iron pipe to be used in conveying gas. Another committee is also cooperating with the American Standards Association in the preparation of a new specification for bell and spigot cast-iron pipe for water and gas. The standardization and development committee of this association devotes its entire time to standardization and development of materials and methods. This associa-

tion maintains a research associate at the Bureau of Standards conducting work on corrosion of cast iron.

Cast Stone Institute, C. G. Walker, assistant secretary, 33 West Grand Avenue, Chicago, Ill. The standardization activities of this institute during the past year were confined largely to cooperation with industry and the Bureau of Standards in the formulation of a commercial standard for colors and finishes for cast stone, which it is expected will be accepted by the industry and architects.

Central Committee on Lumber Standards. (See Ch. VIII, p. 170.)

Certified Milk Producers Association of America (Inc.), Harris Moak, secretary, 360 Park Place, Brooklyn, N. Y. Standardized methods for the production and distribution of "certified milk" as formulated by the American Association of Medical Milk Commissions have been adopted by this organization.

Chamber of Commerce of the United States of America, A. B. Gunnarson, manager of department of manufacture; Philip P. Gott, manager of trade association department; A. B. Barber, manager of transportation and communication department, Washington, D. C. One of the main activities of this organization in the field of standardization is the cooperative and educational service it renders through its large membership and its numerous contacts with business in encouraging the elimination of waste in industry and business. The national chamber also acts as a means for bringing together various groups of industries in an attempt to solve their standardization problems, either alone or through the procedure of the various sections of the United States Department of Commerce created for the specific purpose of aiding this type of work. The chamber, through its department of manufacture, is officially represented on the planning committee which acts in an advisory capacity to the division of simplified practice of the Bureau of Standards. It is cooperating with other organizations, through the National Conference on Street and Highway Safety, in the standardization of traffic laws and regulations and street traffic signs, signals, and markings. The trade association department of the chamber has recently been making a study of trade promotional activities of associations. Included are the activities of some associations with reference to inspecting, certifying, labeling, and guaranteeing the products of

their members to be in accordance with standard specifications.

Clay Products Association, George C. D. Lenth, secretary, 111 West Washington Street, Chicago, Ill. Through its committee on research this association cooperated with several organizations in the formulation of American standard specifications for drain tile conducted under American Standards Association procedure. It has adopted the specifications for clay sewer pipe formulated by the American Society for Testing Materials.

Coal Mining Institute of America, G. W. Grove, secretary, 4800 Forbes Street, Pittsburgh, Pa. In cooperation with other interested organizations and under the procedure of the American Standards Association, this institute has assisted in the formulation of the following American Standards or American Tentative Standards relating to coal mining: Drainage of coal mines; miscellaneous outside coal-handling equipment; wire rope for mines; construction and maintenance of ladders and stairs for mines; rock dusting of coal mines; and use of explosives in bituminous coal mines.

Commission on Standardization of Biological Stains, H. J. Conn, chairman, Agricultural Experiment Station, Geneva, N. Y. This organization cooperated with the Medical Department of the United States Army in the preparation of specifications for biological stains to be adopted by the Federal Specifications Board. The commission has for one of its objects improvement in the quality and reliability of the biological stains on the market. Manufacturers are urged to submit a sample of each batch of any stain to the commission for testing before it is put on the market. Any batch thus tested and found satisfactory may be sold by stain dealers under the commission certification issued in the form of labels and attached to bottles containing stains. Up to the present time over 50 stains have been put on a certification basis by the commission.

Common Brick Manufacturers Association of America, Ralph P. Stoddard, secretary-manager, Guarantee Title Building, Cleveland, Ohio. In cooperation with the American Face Brick Association and other units of industry, this association cooperated in the establishment of standard sizes of face and common building brick, which have been published and promulgated in the form of a simplified practice recommendation by the Bureau of Standards. The association is offi-



cially represented on two sectional committees functioning under American Standards Association procedure. It is continuing its efforts in endeavoring to get its members to produce standard sizes of brick and is publishing a list of its members who have subscribed to the certification plan of the Bureau of Standards or who have had their brick tested and graded according to the association program. Members whose products have been tested and graded in accordance with the above standards are permitted to use the association emblem on their products and in their advertising matter.

Compressed Air Society, C. H. Rohrbach, secretary, 90 West Street, New York, N. Y. This society has issued the fourth edition of a pamphlet entitled "Trade Standards" in which are included the standards relating to the installation, operation, care, and tests of air compressors. The society is officially represented on three ASA sectional committees.

Compressed Gas Manufacturers' Association, F. R. Fetherston, secretary, 110 West Fortieth Street, New York, N. Y. Tentative regulations and specifications for the installation and operation of liquefied petroleum gas storage containers and appurtenant apparatus have been prepared by this association. It has been working for some time in an attempt to develop standard dimensions for valves for use with the various compressed gases. In this connection, it has cooperated closely with the National Screw Thread Commission which has a subcommittee interested in the same project. Another committee of this association has already completed work on standards for safety devices for use on cylinders containing compressed gases. The association is officially represented on six ASA sectional committees through which it takes an active part in the standardization work of other organizations.

Concrete Reinforcing Steel Institute, M. A. Beeman, secretary; R. W. Johnson, engineer, 333 North Michigan Boulevard, Chicago, Ill. Standards of this organization which are published in its handbook Reinforced Concrete include specifications for reinforced concrete, placing of reinforcing steel, intermediate grade new billet steel bars, code of standard practice for the reinforcing steel industry, standard building code for reinforced concrete, recommendations on standard methods of design, and also recommenda-

tions as to standard units of design. In addition, this institute has adopted standard weights for reinforcing bars which correspond to the sizes set forth in the simplified practice recommendation covering this commodity, which has recently been approved as an American standard by the American Standards Association. It served as joint sponsor with the Bureau of Standards in the establishment of the American standard for steel spiral rods for concrete reinforcement. It is also serving as indorsing sponsor for the sectional committee on sizes of forms for concrete ribbed floor construction, functioning under ASA procedure. The institute is now recommending standardization on American-made quality products throughout the country and has published data dealing with this subject for the use of specifiers. It has aided in standardizing the marking of American reinforcing bars so that they can be identified and the tariff commissioner of the United States has required that foreign bars be marked to indicate the country of origin, acting upon petition of the institute.

Consolidated Freight Classification Committee, R. C. Fyfe, chairman, 404 Chicago Union Station, Chicago, Ill. Consolidated Freight Classification No. 7, with subsequent supplements, is issued by this organization. It contains the official, the southern, and the western classifications of freight. For articles requiring shipment in containers, detail specifications for the containers are included in the rules. Copies of this publication are on file in every railroad and agency office in the United States.

Contracting Plasterers International Association, Edward McDonnell, secretary, 4755 Commonwealth Avenue, Detroit, Mich. This association has adopted standard specifications for lathing and plastering which include recommended practices for various types of lath, plastering, and stucco, with requirements for materials or the citing of standard specifications for materials.

Copper and Brass Research Association, H. Foster Bain, managing director; William A. Willis, manager, 25 Broadway, New York, N. Y. Although this organization has not promulgated any standards of its own, it does, however, cooperate with various national organizations interested in the preparation of standards and specifications. The association is officially represented on three ASA sectional committees

and also on several technical committees of the Federal Specifications Board.

Cordage Institute, J. S. McDaniel, secretary, 60 East Forty-second Street, New York, N. Y. A committee of this association cooperated with the Bureau of Standards in the revision of the simplified practice recommendation for hard fiber twines (ply and yarn goods) which was promulgated during the past year. The association maintains a research associate at the Bureau of Standards working on measurements of manila rope with a view to revising the Federal specification for manila rope.

Cotton-Textile Institute (Inc.), George A. Sloan, president, 320 Broadway, New York, N. Y. In the development of standards and specifications, this institute cooperates with large cloth and yarn manufacturers, consumer organizations, Federal Government departments, commercial firms, and trade associations. It has taken an active part in the establishment and adoption of, and is represented on, the standing committees on commercial standards for cotton fabric, tents, tarpaulins, and covers; cotton cloth for rubber and pyroxylin coating; and simplified practice recommendation for full disk buffing wheels.

Cover Paper Manufacturers Association, E. H. Naylor, secretary, 95 State Street, Springfield, Mass. This association has adopted standard ream weights for the various sizes and substances for cover paper which are published in a publication entitled "Trade Customs."

Crown Manufacturers Association of America, Louis B. Montfort, executive secretary, Munsey Building, Washington, D. C. This association cooperated with the Glass Container Association, the American Bottlers of Carbonated Beverages, and other units of the industry in the standardization of carbonated beverage bottles as set forth in the simplified practice recommendation established under the auspices of the Bureau of Standards.

Dairy and Ice Cream Machinery and Supplies Association (Inc.), Roberts Everett, executive vice president, 225 West Thirty-fourth Street, New York, N. Y. Practically all of the work of this association in simplification and standardization has been done in cooperation with the International Association of Ice Cream Manufacturers with respect to ice-cream cups and cup caps, ice-cream cans and 2-gallon ice-cream molds for pint and quart machine-filled ice-cream cartons. It has

also collaborated with the International Association of Milk Dealers on a simplification of cottage-cheese and sour-cream glass containers.

Diamond Core Drill Manufacturers Association, C. H. Rohrbach, secretary, 90 West Street, New York, N. Y. In cooperation with the standing committee of the industry, this association revised the commercial standard for diamond core-drill fittings which was established under the auspices of the Bureau of Standards. This association has adopted an emblem to be attached to drill fittings or on packages or cartons containing the products to insure users that they are made in conformity with the requirements given in the commercial standards relating to these items. These emblems are supplied only to manufacturers whose plants are equipped with the necessary gages for producing the standard diamond core-drill fittings.

Diesel Engine Manufacturers' Association, H. B. Taylor, president, Lincoln-Liberty Building, Broad Street and South Penn Square, Philadelphia, Pa. This organization has prepared and issued a booklet in which are set forth standards dealing with principles of business, practices, selection, and installation of stationary Diesel engines, and definitions.

Drill and Reamer Society, now a division of the Metal Cutting Tool Institute. (See p. 205.)

Eastern Supply Association, Frank S. Hanley, secretary, 261 Broadway, New York, N. Y. In cooperation with the Bureau of Standards this association has assisted in the establishment of commercial standards for genuine wrought-iron and steel pipe nipples, and simplified practice recommendations relating to range boilers and plumbing fixtures.

Electric Steel Founders' Research Group, R. A. Bull, director, 541 Diversey Parkway, Chicago, Ill. Standardization activities of this organization consist in the formulation of its own group inspection standards and in cooperating with national organizations in the development of standardization projects. Products of member companies are required to conform to standards of quality, mutually agreed on and self-imposed. This group, through delegated representatives, has taken part in joint activities sponsored or participated in by the Bureau of Standards in respect to simplification and standardization, regarding pattern construction, foundry refractories, etc.

Electrochemical Society (Inc.), Dr. Colin G. Fink, secretary, Columbia



University, New York, N. Y. The society is continuing its cooperative work with the American Society for Testing Materials and other organizations in determining the resistance to corrosion of various metals and alloys, and also in developing specifications for the electrodeposition of copper, chromium, nickel, zinc, and other metals.

Employing Bookbinders of America, A. E. Ommen, counsel, 28 West Forty-fourth Street, New York, N. Y. The standardization committee of this organization, which has recently been merged with the research committee, cooperated with manufacturers of pyroxylin coated fabrics for the book-binding trade in standardizing the basic gray goods, coating and strength, and has also established classifications of the relative qualities of goods produced by the various manufacturers. It is hoped that through the efforts of this association every piece of goods manufactured and delivered to the industry will eventually be marked with a guaranty of the individual member of the association behind its production.

Food Service Equipment Association (Inc.), H. B. Blanke, executive secretary; M. P. Duke, chairman of standardization and simplification committee, 10 South La Salle Street, Chicago, Ill. In accordance with a resolution adopted at its 1931 annual convention this association, through its standardization and simplification committee, is actively cooperating with the division of simplified practice of the Bureau of Standards in bringing about a standardization of sizes and varieties of kitchen and restaurant equipment and utensils. The primary work of the committee consists in the formulation of standard specifications and simplified practice recommendations covering gages, weights, measures, and dimensions for metal sheets, tubing, pipe, sinks, table bases, shelves, racks, table bins and tops, lunch and cafeteria counters, steam tables, etc.

Glass Container Association of America, Victor L. Hall, secretary standardization committee, 19 West Forty-fourth Street, New York, N. Y. This association cooperated with various industries in the establishment of simplified practice recommendations relating to sizes and types of glass containers used in the packing of food products, which are being promulgated by the Department of Commerce. Through the work of its standardization committee this association published a book in which are included over 50

blue prints relating to standard types of glass container finishes.

Glycerine Producers' Association, Roscoe C. Edlund, manager, 45 East Seventeenth Street, New York, N. Y. This organization is a part of the Association of American Soap and Glycerine Producers. This association permits those members who produce radiator glycerine and follow uniformly the association's formula developed by its research committee and laboratory to sell the product under the grade name "G. P. A. Radiator Glycerine," which is the association's designation for a new grade of glycerine specially developed and manufactured for antifreeze use in automobiles and marketed in containers bearing the association's seal as part of a uniform design. The association's research laboratory tests samples of G. P. A. radiator glycerine manufactured by its members to verify compliance by the manufacturers with the association's formula, and in order to assure the public that all products labeled "G. P. A." meet the association's specifications.

Grain and Feed Dealers National Association, Charles Quinn, secretary, Toledo, Ohio. A handbook of official standards for wheat, shelled corn, oats, and rye, being a tabulated and abridged description of the official grain standards of the United States as established and promulgated by the Secretary of Agriculture, has been issued by this association. In its effort to insure adherence by its members to the standards which this association has officially adopted, it has incorporated in its by-laws a clause whereby any member found guilty by the United States Department of Agriculture of a violation of section 5 of the grain standard act is automatically expelled from the association and notice of his expulsion is published in the association's official organ.

Gray Iron Institute, Arthur J. Tuscany, manager, 4300 Euclid Avenue, Cleveland, Ohio. This institute has completed a very important activity in connection with specifications for gray cast iron. After a considerable amount of research and investigational work in setting up different test bars and as a result of data secured by its technical department in cooperation with the American Society for Testing Materials, it revised the specifications for gray cast iron by including additional test bars and establishing seven classes of material according to minimum tensile strengths. The institute has developed plans for furnishing certified

gray cast iron. In accordance with these plans a test bar from each heat of its member companies' plants will be examined and the results carefully recorded. Members whose products comply with certain specifications approved by the institute will be furnished certificates showing compliance with these specifications. Upon request of the buyer, the manufacturer shall be prepared to certify that his product conforms to the requirements and tests set forth in the specifications.

Grinding Wheel Manufacturers Association of the United States and Canada, Frank R. Henry, secretary, Dayton, Ohio. This organization cooperated with industry under the auspices of the Bureau of Standards in the establishment of the simplified practice recommendations covering standard sizes of grinding wheels and abrasive wheel sizes. It served as joint sponsor for the ASA sectional committee on safety code for the use, care, and protection of abrasive wheels.

Gummed Industries Association, D. A. Crocker, secretary, 370 Lexington Avenue, New York, N. Y. The standing committee of the industry for simplified practice recommendation for No. 1 kraft sealing tape initiated and adopted by this organization under the auspices of the Bureau of Standards, is at the present time conducting investigations in the hope of adopting additional standards relating to the adhesive qualities of sealing tape. This investigation is being carried on principally by consumers in cooperation with manufacturers. The association has made arrangements with a commercial testing laboratory whereby acceptors of the simplified practice recommendation for No. 1 kraft paper sealing tape may have available satisfactory means of testing tape which they manufacture, distribute, or consume.

Gypsum Association, H. J. Schweim, secretary-chief engineer, 211 West Wacker Drive, Chicago, Ill. The work of this association in standardizing the various kinds of gypsum plasters, boards, and block is carried on in cooperation with the committee on gypsum functioning under the procedure of the American Society for Testing Materials. This committee has already issued 11 standard specifications covering gypsum products in addition to a standard method of testing gypsum and gypsum products and standard definitions of terms relating to the gypsum industry. The committee is at the present time engaged in developing

a standard method of determining the sand content of set plaster. This association has also adopted standard specifications for gypsum plastering covering the mixing and application of gypsum plaster to the various bases or backgrounds commonly used in building construction. The technical problems committee of the association has prepared a set of regulations covering gypsum products and constructions for use as a suggested section in the compilation or revision of building codes.

Hack Saw Manufacturers Association of America (Inc.), W. P. Jeffery, managing director, 1 Wall Street, New York, N. Y. This association initiated the movement for simplification of hack saw blades which resulted in the establishment of the simplified practice recommendation relating to standard sizes of tungsten blades and high-speed blades. These sizes have been unanimously accepted by the industry.

Hardwood Interior Trim Manufacturers Association, L. A. Rhodes, assistant secretary, 63 South Third Street, Memphis, Tenn. The rules and regulations for hardwood interior trim and molding adopted by this association are in accordance with the American lumber standards with respect to sizes and molding patterns. The association maintains an inspection service which is available to members for the settlement of disputes arising as regards quality, quantity, species, or workmanship of lumber sold.

Hardwood Manufacturers Institute, J. H. Townshend, executive vice president, Bank of Commerce Building, Memphis, Tenn. This organization inaugurated a "car-card plan" by which licensed lumber manufacturers issue car cards guaranteeing the contents of the car to be in compliance with the inspection rules of the National Hardwood Lumber Association.

Heating and Piping Contractors National Association, Joseph C. Fitts, secretary, 50 Union Square, East, New York, N. Y. The committee on standards of this association prepared and issued the second edition of a publication entitled "Engineering Standards." The association is conducting a national campaign for certified heating based on the engineering standards to replace the purely local programs formerly in use. In connection with this campaign it has adopted a national insignia, including a certified heating supplementary certificate to be sent with each bid, the plate to be attached to each boiler, and the certificate to be issued on completion of the



work to the house owner, certifying that the heating system was installed in accordance with the certified heating standards adopted by the association. The committee on welding prepared a standard manual on pipe welding which has been published by the association and in which are included, among other material, standards and specifications covering welding of steel and wrought iron pipe which have been adopted by the association. This organization has also adopted specifications for welding neck flanges for standard pipe and for extra heavy pipe. It cooperated with the Bureau of Standards in the establishment of commercial standards for wrought-iron pipe nipples and standard-weight malleable iron or steel screwed unions; also, in the elimination of sizes of steam-type radiators and of surplus pipe sizes. The association served as joint sponsor for the sectional committee on pipe flanges and fittings, functioning under American Standards Association procedure.

Hickory Handle Association, Guy E. Bayse, secretary, care of W. E. Bruner & Sons, Heber Springs, Ark. In cooperation with representatives of the industry, this association cooperated in the establishment of the simplified-practice recommendation relating to standard definitions for various quality grades of hickory handles.

Hollow Metal Manufacturers Association, Charles F. Burt, executive director, 237 Terminal Tower Building, Cleveland, Ohio. This association cooperated with the Bureau of Standards and several units of industry in the establishment of commercial standards for various types of builders' hardware (template and nontemplate) and simplified-practice recommendations relating to kalamein and hollow-metal doors. In cooperation with the American Institute of Architects and builders' hardware manufacturers, this association standardized butt hinges, cylinder locks, and letter-box plates for hollow-metal doors.

Hydraulic Society, C. H. Rohrbach, secretary, 90 West Street, New York, N. Y. During the past year this society issued the sixth edition of its publication relating to standards in which are included definitions, terms, and practices for recommended use by the members of the pump industry. The society cooperates with the United States Department of Commerce, Chamber of Commerce of the United States of America, American Society of Mechanical Engineers, American Min-

ing Congress, National Fire Protection Association, trade associations, and all other technical and commercial organizations with which the pump industry has problems in common. It is officially represented on four ASA sectional committees.

Illuminating Engineering Society, D. W. Atwater, general secretary, 29 West Thirty-ninth Street, New York, N. Y. The following standards have been prepared under the sponsorship of this society: Code of street lighting, automotive lighting specifications, testing specifications for lighting equipment, and specifications for residential lighting equipment. It is also serving as sponsor or joint sponsor for sectional committees, functioning under American Standards Association procedure, dealing with code of lighting factories, mills, and other work places; standards of school lighting; and illuminating engineering nomenclature and photometric standards.

Insecticide and Disinfectant Manufacturers Association changed to National Association of Insecticide and Disinfectant Manufacturers (Inc.). (See p. 207.)

Institute of American Meat Packers, W. W. Woods, president, 506 South Wabash Avenue, Chicago, Ill. The committee on standardization of this institute has been active during the past year in formulating new standards and in revising existing ones. In cooperation with a committee representing the National Canners' Association and the National Meat Canners' Association this committee made a survey of weights of sliced dried beef packed in glass jars with the result that it has made recommendations for certain standard weights and packs. This same committee also formulated standards for the packing of vinegar-pickled tidbits, pork-feet cutlets, and pork-feet slices in glass jars; and for the packing of glass jars of vinegar-pickled products in outside containers. The committee has also prepared new and revised twine specifications for tying boned hams, picnics and shoulders; roping boned loins for boiling; and tying paper-wrapped smoked meats. It also prepared standards for 17-pound sausage in oil cans, and the packing of sliced bacon.

Institute of Boiler and Radiator Manufacturers, F. W. Herendeen, secretary, Geneva, N. Y. Through the efforts of its members this institute has formulated a standard heating boiler testing code for solid-fuel-burning low-pressure steam boilers. It maintains

official representation on the ASME boiler code committee and on the ASA sectional committee on pipe threads.

Institute of Leather Cloth and Lacquered Fabrics Manufacturers, C. Stewart Comeaux, secretary, 103 Park Avenue, New York, N. Y. This organization, formerly known as the association of Pyroxylin Coated Fabric Manufacturers, cooperated with the cotton textile manufacturers in the preparation of standard specifications for cotton goods used in the manufacture of pyroxylin-coated fabrics.

Institute of Makers of Explosives, C. Stewart Comeaux, secretary, 103 Park Avenue, New York, N. Y. This institute established standard recommended sizes of cartridges and strengths of high explosives. It is officially represented on the ASA sectional committee on recommended practice for the use of explosives in bituminous coal mines.

Institute of Manufacturers of Vitreous China Plumbing Fixtures, George E. Hoffman, chairman manufacturers' advisory committee, care of Crane Co., Chicago, Ill. The institute cooperated in the preparation of a commercial standard for colors for sanitary ware, which establishes six definite colors for plumbing fixtures. The institute is cooperating with the Federal Specifications Board in the revision of Federal specification for plumbing fixtures. It also cooperated with the American Society of Sanitary Engineering in making studies of the prevention of cross connections between potable water supply and drainage systems, where vitreous-china plumbing fixtures are involved. The institute assisted in the establishment of the commercial standard relating to colors for sanitary ware. The institute has a liaison contact with the subcommittee on plumbing of the Building Code Committee of the United States Department of Commerce.

Institute of Paint and Varnish Research, Henry A. Gardner, director of laboratory, 2201 New York Avenue NW., Washington, D. C. During the past 20 years this institute has issued over 500 publications in connection with its research work. They include several volumes, among which is a textbook of methods for the physical and chemical examination of paint products. The methods given in this book have become more or less standard in the industry. The institute cooperates with the Bureau of Standards on research problems and with the Federal Specifications Board in preparing specifications for paints and varnish.

Institute of Radio Engineers, Harold P. Westman, secretary, 33 West Thirty-ninth Street, New York, N. Y. One of the functions of the standards committee of this institute is to review, approve, or revise the various standard definitions and technical reports which are prepared by the institute's technical committees dealing with the following subjects: Fundamental units and measurements, radio receivers, radio transmitters and antennas, vacuum tubes, electroacoustic devices, and electrovisual devices. During the past year there was prepared a preliminary report relating to a set of standard definitions on electrovisual devices, tests of high-frequency receivers, thermoelements at high frequencies, field strength measurements, and electromagnetic units and measurements. The sections dealing with tests of broadcast radio receivers, methods of testing vacuum tubes, and tests of transmitters and antennas appearing in the 1931 report have been revised and considerably enlarged. The preliminary report also contains definitions on general radio terms, wave propagation, transmission, reception, antennas, direction finding, vacuum tubes, electroacoustic devices, electrovisual devices, circuit elements, devices and instruments, standard graphical symbols, abbreviations, and safety standards for radio transmitting equipment. Following the approval of the report by the standards committee it is expected that a new set of standards will be published by the institute in 1933.

Insulated Power Cable Engineers Association, R. J. Wiseman, secretary, care of the Okonite Co., Passaic, N. J. This association acts as an advisory committee to the power cable division of the National Electrical Manufacturers' Association. During the past year it prepared or revised specifications covering the following items: Specifications for varnished-cambric-insulated cables (second edition); specifications for impregnated-paper-insulated lead-covered cables (fourth edition); recommended walls of insulation and lead sheaths for impregnated-paper lead-covered cables (revised); specifications for metallic coverings for power cables; specifications for construction of rope core or annular core cables (second edition); minimum-size conductors for impregnated-paper and varnished-cambric cables for various voltages; ratio of a. c. to d. c. resistance of large multiple-conductor cables; and installation and proof test of rubber-insulated cables.



International Acetylene Association, H. F. Reinhard, secretary, 30 East Forty-second Street, New York, N. Y. Standards relating to hose connections on gas regulators and blowpipes or torches and specifications of the Interstate Commerce Commission for the construction of cylinders used in the transportation of acetylene gas have been adopted by this association. It is continuing its cooperation with the Compressed Gas Manufacturers' Association in the preparation of standards for threading of valves used in cylinders for storing compressed gases.

International Apple Association, R. G. Phillips, secretary, 1108 Mercantile Building, Rochester, N. Y. This association has been instrumental in promoting Federal and State legislation for the standardization of fruit and vegetable containers. It cooperated with Members of Congress in the passage of the standard barrel law and the standard basket and hamper acts. It also assisted in the passage of the New York State apple grading law which is being used as a model for the drafting of legislation by other States in the so-called barrel apple territory.

International Association of Electrical Inspectors, Victor H. Tousley, secretary, 612 North Michigan Avenue, Chicago, Ill. One of the primary objects of this organization is the development of standards whereby fires and accidents due from electrical causes may be reduced to a minimum. It has prepared standard forms for inspections of electrical work by municipalities. Working in cooperation with a joint committee, this association formulated and adopted standards for residence wiring. During the past year committees of this association completed standards which have to do with the method of investigating and reporting electrical fires and accidents.

International Association of Electrotypers, Neal Gross, field secretary, 949 Leader Building, Cleveland, Ohio. This association has prepared standards for printing plates. These standards cover thicknesses and tolerances for unmounted and curved electrotypes, bevel of edges of patent base plates, thickness of shell, and standard formula of electrotype-backing metal.

International Association of Ice Cream Manufacturers, Robert C. Hibben, executive secretary, Telegraph Building, Harrisburg, Pa. The simplified-practice committee of this association working in cooperation with various

units of the industry completed a simplification program on the following items: Ice-cream cans, machine-filled ice-cream cartons, 2-gallon ice-cream molds, and ice-cream cups and cup caps. This association cooperated with the International Association of Milk Dealers in the formulation of standards for sanitary pipe fittings. The simplified-practice committee is now working on a simplification of bulk single service shipping containers refrigerated with solid carbon dioxide.

International Association of Industrial Accident Boards and Commissions, Charles E. Baldwin, secretary, United States Bureau of Labor Statistics, Washington, D. C. This organization served as joint sponsor on projects resulting in American standards and tentative standards under American Standards Association procedure for the following: Safety code for the use, care, and protection of abrasive wheels; safety code for mechanical power-transmission apparatus; safety code for rubber mills and calendars; and safety code for woodworking plants. It is also acting as joint sponsor on work still in progress on the standardization of methods of recording and compiling accident statistics. The association is officially represented on 17 other ASA sectional committees on work which has resulted in American standards and tentative standards and on 5 committees in which work is still under way.

International Association of Milk Dealers, R. E. Little, executive secretary, 228 North La Salle Street, Chicago, Ill. This association initiated the movement for the establishment of simplified sizes and dimensions for milk bottles and bottle caps which resulted in the adoption and acceptance by industry of the simplified-practice recommendation relating to these items. Under the auspices of the Bureau of Standards, it cooperated with bottle manufacturers in the standardization of glass containers for sour cream and cottage cheese. The association has adopted standard dimensions for sanitary pipe fittings, standard sizes and dimensions of thermometer spuds for use in coil vats and glass-lined tanks, standard diameters and taper for milk can necks and standard dimensions relating to paper seal sanitary fittings.

International Association of Municipal Electricians, M. G. Lloyd, chairman, standardization committee, Bureau of Standards, Washington, D. C. This association has formulated and adopted standard specifications for under-

ground and aerial cables for fire alarms, police telegraph, traffic signals, and street-lighting service. At the present time it has under consideration the development of a standard for weatherproof copper-covered steel wire and a model ordinance for electrical inspection.

**International City Managers' Association**, Clarence E. Ridley, executive director, 923 East Sixtieth Street, Chicago, Ill. The research work of this association is largely concerned with the establishment of standards of administration for the various municipal departments. Uniform budgetary accounting systems, and work programs have been formulated. Demonstration installations of the operation of these proposals and standards have been made in six cities, namely: Brunswick, Ga.; Winona, Minn.; Kenosha, Wis.; Troy, N. Y.; Lexington, Ky.; and Cincinnati, Ohio. Manuals describing these installations and the use of these standards have been published and distributed to city officials and other interested groups throughout the country and are now being employed to standardize the work generally. This work is being done under the name of the Committee on Uniform Street and Sanitation Records. The research staff of this association, jointly with the American Road Builders' Association, is engaged in a joint-committee project representing twelve national associations for the purpose of standardizing street-maintenance records and devising street-maintenance standards. The association is also working on a standardization program in the field of police records which is aimed to improve and standardize police administration throughout the country. The association is represented on the National Committee on Municipal Reporting which last year prepared a report, *Public Reporting (Municipal Administration Service)*, in which were set forth certain specifications for the preparation of annual municipal reports.

**Kraft Institute**, Hugh Wright, manager of bag division, 122 East Forty-second Street, New York, N. Y. The standard sizes of paper grocers' bags established by industry and promulgated as a simplified-practice recommendation by the Bureau of Standards have been adopted by this institute. In addition, it has adopted standard basis weights for the various sizes of grocers' bags, and standards for odd bags, covering dimensions, basis weights, and packing, and width of roll from which the bag is made. The

institute has two symbols which the manufacturer may use to label his product, one symbol meaning standard size and the other meaning standard size and standard weight.

**Laundryowners National Association of the United States and Canada**, Lloyd A. Peck, general manager, Joliet, Ill. This association has prepared and issued specifications which include recommended standard procedure for washroom and finishing practice. As a result of a campaign to standardize accounting methods within the industry, this association was instrumental in bringing about the establishment of over 1,000 uniform-cost-accounting systems by its members. The engineering department is assisting association members in solving production and power problems with a view toward standardization and the reduction of costs. The American Institute of Laundering, controlled and operated by the Laundryowners National Association, maintains research laboratories for developing and perfecting better laundering methods, for the analysis of the cause of damage to damaged articles, and for studying at manufacturers' requests, the laundering qualities of textiles before they are put on the market. The association served as joint sponsor for the sectional committee on safety code for laundry machinery and operations, functioning under the rules of procedure of the American Standards Association.

**Lead Industries Association**, F. E. Wormser, secretary, 420 Lexington Avenue, New York, N. Y. This association has approved a new standard of lead pipe sizes which is being adopted by the principal manufacturers as an aid to consumers. In addition to eliminating numerous variations in pipe sizes now found among lead pipe manufacturers, the present standard sizes of lead pipe in the A, AA, and AAA classifications (or "Strong," "Extra strong," and "Double extra strong") will withstand safely constant cold-water pressures of 50, 75, and 100 pounds per square inch, respectively. Prior to the adoption of this standard there was no uniformity with respect to the pressures the various classes of lead pipe could withstand.

**Lithographers National Association (Inc.)**, Maurice Saunders, secretary, 104 Fifth Avenue, New York, N. Y. In cooperation with the Bureau of Standards, this organization assisted in the establishment of the simplified practice recommendation for paper in which



are set forth a list of standard stock sizes of paper for general printing and publishing, book publishers' paper, and forms and letterheads.

Malleable Iron Research Institute, Robert E. Belt, secretary, Union Trust Building, Cleveland, Ohio. This organization took an active part in the establishment of the simplified-practice recommendation for malleable foundry refractories, and the commercial standard relating to foundry patterns of wood. The institute has adopted a procedure of certifying the product of such of its members which regularly and consistently meets the institute's prescribed quality specifications as to tensile strength, yield point, and elongation. Certificates are issued covering a quarter year period and state that the company has daily submitted test bars representative of its product and that the product meets the requirements of the institute for quality. These certificates also permit the manufacturers to use the institute's trade-mark and to advertise their products as having been certified by the institute.

Manganese Track Society, W. Homer Hartz, chairman, standardization committee, care of Morden Frog & Crossing Works, Chicago, Ill. The standardization committee of this society is continuing its cooperation with the track committee of the American Railway Engineering Association in the production of AREA track-work plans, which include standard designs, constructions, and dimensions; also an appendix giving requirements for materials for switches, frogs, guard rails, crossings, turnouts, and crossovers.

Manufacturers Standardization Society of the Valve and Fittings Industry, John J. Harman, general secretary, 103 Park Avenue, New York, N. Y. This society cooperated with the Bureau of Standards in the formulation of the simplified-practice recommendations dealing with sizes of wrought-iron and wrought-steel pipe, valves and fittings. It is joint sponsor with the American Society of Mechanical Engineers and the Heating and Piping Contractors National Association for the ASA sectional committee on pipe, flanges, and fittings.

Maple Flooring Manufacturers Association, E. C. Singler, secretary, 332 South Michigan Avenue, Chicago, Ill. This association has established standards of grades and sizes of northern hard maple, beech, and birch flooring. One of the most recent activities of this association has been the formulation of a standard specification for

laying and finishing MFMA northern hard-maple flooring. The association maintains supervision over the products of its members through regular grade inspection at the mills, and where complaints on such products arise, reinspection service is extended. The right and license to use the MFMA trade-mark is given only to members of the association. They are authorized to issue car cards (furnished by the association) used in certifying as to the contents of the car.

Mayonnaise Manufacturers Association, Frank Honicker, executive manager, 1500 Walnut Street, Philadelphia, Pa. This association sponsored the movement for a simplification of glass containers for mayonnaise and kindred products which resulted in the establishment of a simplified-practice recommendation which provides five standard stock sizes of glass containers based on liquid capacity.

Mellon Institute of Industrial Research, E. R. Weidlein, director, University of Pittsburgh, Pittsburgh, Pa. Some of the research and experimental work carried on at the institute, in collaboration with industrial associations, has resulted in the development of specifications and standards for these organizations. It has cooperated actively with the American Society for Testing Materials and with the Magnesite Association of America, solved problems in testing of containers for the Paperboard Industries Association, made studies pertaining to the devising of washroom formulas and standardization of washroom practice for the Laundryowners National Association, aided various societies in their textile testing and standardization programs, and worked out specifications for cleaners' naphtha for the Mundatechnical Society of America, which were later adopted by industry and published as a commercial standard by the Bureau of Standards.

Metal Cutting Tool Institute, Harry C. Hungerford, secretary, 410 Asylum Street, Hartford, Conn. This institute, which has recently been organized, is a consolidation of the former Tap and Die Institute, the Milling Cutter Society, and the Drill and Reamer Society. In revising its standard listing for taps this organization has incorporated the screw thread designations recommended by the National Screw Thread Commission, which supersede the old system of marking. The standards committee of the tap and die division has established and adopted a new standard for commercial ground thread taps. During the past year it

has been working with the ASA sectional committee on the standardization of small tools and machine-tool elements, and is now cooperating with the American Railway Tool Foremen's Association on a revised standard for shank and square dimensions covering regular and spindle staybolt taps. The committee is also engaged in making a complete revision of standard listing for physical dimensions and tolerances covering all styles of taps and dies. Milling-cutter manufacturers have cooperated with a sectional committee of the American Standards Association in developing an American standard for milling cutters. The standards committee of the milling-cutter division has completed work on a revised listing for milling cutters for manufacturers' catalogues which has resulted in a substantial reduction of sizes and styles formerly listed as standard. The division has established tables covering standard tolerances for all general dimensions for milling cutters. The drill and reamer division has established a standard listing covering general dimensions and tolerances for all regular sizes and styles of twist drills. It is now working on a general revision of the standard listing covering sizes and dimensions and tolerances for reamers to which have been added such new tools as expansion chucking, spiral fluted locomotive, and helical taper pin reamers. In connection with the standardization of reamers, the division is cooperating with an ASA sectional committee for the purpose of establishing an American standard for all rotating tool shanks.

Milk and Ice Cream Can Institute, D. S. Hunter and F. W. Donahoe, Commissioners, Keith Building, Cleveland, Ohio. Since March, 1930, when this institute was organized, it has made semiannual surveys covering the actual shipments of each type and size of milk cans and of ice cream cans. This has led to the elimination of several types and sizes for which there was practically no demand. In addition, there has been a steady and gradual standardization of gages of the steel used in the various parts of milk cans so that, at the present time, there is a reasonable uniformity of weights in the cans of 20-quart capacity up to and including those of 46-quart capacity.

Millers' National Federation, Herman Steen, secretary, 2719 Board of Trade, Chicago, Ill. This organization cooperated with the United States Department of Agriculture in the establishment of Federal definitions and

standards for flour, grain, and by-products. The federation is continuing its work relative to the standardization of various sizes of packages for flour.

Milling Cutter Society, now a division of the Metal Cutting Tool Institute. (See p. 205.)

Millwork Institute of California, L. G. Sterett, secretary, 522 Patterson Building, Fulton and Tulare Streets, Fresno, Calif. The standards for millwork, compiled by this organization, are set forth in its publication entitled "Accredited Standards for Architectural Woodwork," which include interior finish, jambs, jamb and trim assemblies, cabinet work, panelings, cabinets and built-in fixtures, stair work, doors, windows and sash, blinds and shutters, screens, exterior finish and frames, glass, and glazing. In the license agreement between the institute and a member, the institute agrees to issue a license of "Manufacturer of architectural woodwork" to the member, in which it is stated that all products furnished by the member when stamped, labeled, or branded with the official certificate mark of the institute must be manufactured in accordance with the accredited standards of architectural woodwork. They are then guaranteed by the Millwork Institute of California.

Mirror Manufacturers Association, North Storms, secretary, 2217 Tribune Tower, Chicago, Ill. This association is extending the use of the commercial standard covering various grades and quality requirements for plate-glass mirrors which was established several years ago under the auspices of the Bureau of Standards. Many of the mirror manufacturers who are members of the association are permitted to use its label which bears the association insignia and in which is incorporated a written guarantee that the mirror to which the label is attached meets the requirements of the commercial standard.

National Association of Building Owners and Managers, Lewis B. Ermeling, executive secretary, 134 South La Salle Street, Chicago, Ill. Much of the standardization work of this organization relating to building construction and operation is carried on in cooperation with the American Standards Association, National Safety Council, and the Bureau of Standards. Through its own efforts it has established standard forms of statement for rental income and expense, standard method of accounting for building manage-



ment, standard method of floor measurement, and forms concerning leases, records, etc.

National Association of Dyers and Cleaners of the United States and Canada, Walter H. Franks, managing director, Silver Spring, Md. This association cooperated with other units of the industry in the establishment of quality standards for Stoddard solvent, published as a commercial standard by the Bureau of Standards, which is co-operating in making a study of the characteristics of dry-cleaning solvents with a view to further standardizing and improving materials and methods of testing materials. The association has laboratories of its own where research work is carried on in the fundamental problems of the dyeing and cleaning industry and where instruction is given to members in the standard practices developed at the laboratories. Three textbooks on garment cleaning have been published, in which are given standard recommended practices in cleaning of various materials, standard tests for identifying fabrics, and standard formulæ for soaps and cleaning compounds, etc.

National Association of Farm Equipment Manufacturers, H. J. Sameit, secretary, 608 South Dearborn Street, Chicago, Ill. This association initiated the movement for the establishment of simplified sizes and varieties of plows and tillage implements. It also co-operated with manufacturers of plow, machine, and carriage bolts, which resulted in the simplified-practice recommendations on plow bolts promulgated by the United States Department of Commerce. The executive committee of this association has recently requested the general committee on simplification and standardization to undertake a survey looking toward a further reduction of sizes and varieties of farm tools and implements.

National Association of Finishers of Textile Fabrics, George L. Sawyer, secretary, 40 Worth Street, New York, N. Y. This organization was formerly known as the National Association of Finishers of Cotton Fabrics. Standards adopted by this association include power-laundry washing methods with respect to white goods; methods for testing cotton fabrics to determine their fastness to light and power washing; and a standard method for the return by finishers to the converter of all stretched as well as damaged goods, and remnants of finished merchandise over 1 yard in length. The association has made arrangements with a commercial testing laboratory

to conduct tests of all member goods to determine the degree of fastness to light and washing. Licensed finishers whose goods receive an "A" or "B" rating for fastness to light and washing are granted the use of the association's "Nafal" label, showing that the particular dyeing from which the sample was taken has passed the requirements and tests of the association's standard for fast colors.

National Association of Furniture Manufacturers (Inc.), A. P. Haake, managing director, 666 Lake Shore Drive, Chicago, Ill. This association cooperated with the Mirror Manufacturers Association and the Bureau of Standards in the establishment of the commercial standard for plate-glass mirrors. Several divisions of the association are continuing their work on the simplification and standardization of beds, springs, and mattresses and on the quality of materials used in the manufacture of upholstered furniture.

National Association of Hosiery and Underwear Manufacturers, Earl Constantine, managing director, 468 Fourth Avenue, New York, N. Y. This organization has formulated and adopted standards for a method of measuring the size or foot of hosiery, hosiery boxes, percentage of oil on rayon yarn, standard hosiery lengths, stainless lubricating oil for knitting machines, and a commercial standard for regain of mercerized cotton yarn. It has also prepared a specification for standard aviator's hose which has been recommended to the Navy Department. It initiated and cooperated in the establishment of the commercial standard for hosiery lengths promulgated under the auspices of the Bureau of Standards. This association maintains two research associates at the Bureau of Standards for the purpose of making studies of methods of manufacturing hosiery and knit goods. This association is cooperating with the Bureau of Standards in the development of standard lengths for various parts of men's and women's hosiery, a standard method for evaluating the color of raw silk, and a specification for the wearing quality of hosiery.

National Association of Insecticide and Disinfectant Manufacturers (Inc.), Harry W. Cole, secretary, P. O. Box 428, Holbrook, Mass. This association, organized in 1914 and formerly known as the Insecticide and Disinfectant Manufacturers' Association, is composed of manufacturers and distributors of disinfectants, household insecti-

cides, liquid soaps, and other products used in the promotion of sanitation. The majority of the disinfectant members of this association standardize their products by bacteriological means, employing for this purpose the methods of testing antiseptics and disinfectants which are set forth in the United States Department of Agriculture Circular No. 198. During the past year this association adopted official minimum standards for general household liquid spray insecticides, as recommended by the insecticide committee, and an official method for testing such insecticides. At the present time it has under consideration the establishment of a laboratory for the purpose of testing products made by its members, as well as those produced by nonmembers with the idea of affixing a seal of approval to those products which are shown by test to possess the required standard of merit.

National Association of Mutual Casualty Companies, J. M. Eaton, secretary, 230 North Michigan Avenue, Chicago, Ill. As a member body of the American Standards Association, this organization carried on standardization work which resulted in the formulation of 14 American standard and tentative standard safety codes.

National Association of Paint Distributors, George V. Horgan, general manager, 2201 New York Avenue NW., Washington, D. C. (For simplification and standardization activities of this association see sketch on p. 181.)

National Association Practical Refrigerating Engineers, Edward H. Fox, secretary, 435 North Waller Avenue, Chicago, Ill. Two standing committees—the committee on standards and the committee on engine room records—cooperate with committees of other organizations in carrying forward work in the standardization of refrigeration equipment. The association is officially represented on the ASA sectional committee in the formulation of the American standard code for mechanical refrigeration and in the preparation of standard specifications for cast iron flanged ammonia fittings, and a standard code for pressure piping.

National Association of Purchasing Agents, G. A. Renard, secretary-treasurer, 11 Park Place, New York, N. Y. Several committees of this association are actively carrying forward work in the standardization and simplification of various lines of commodities of interest to members of the purchasing profession. In cooperation with committees of other organizations, this as-

sociation adopted the national standard catalogue size; standard coal contract form; standard forms of contract for erected and nonerected conveyor equipment; commercial forms and paper sizes; standards covering various grades and quality of brass pipe nipples; and domestic and industrial fuel oils. The coal committee of this organization is continuing its work in the development of the survey on use classification of coal for stationary steam generation. The paper shipping container buyers' group has completed its project for developing an outline for scope of specifications to be used in ordering paper shipping containers made of corrugated fiber board. The group is now concerning itself with the establishment of standard nomenclature to be used for shipping containers. Work in the development of standard methods of testing cotton goods is still in the hands of the cotton fabrics committee while the preparation of standards covering certain chemicals is being handled by another group in the association in cooperation with the Bureau of Standards. During the past year the committee on uniform markings on valves and fittings held a joint meeting with manufacturers for the purpose of developing a code for uniform markings on valves and fittings based on a survey of present markings which were shown to be incomplete and inadequate. The iron and steel committee has formulated a standard code for marking steel in bars which has been adopted by both the Federal Standard Stock Catalogue Board and the United States Navy Department. The committee also is cooperating with the Institute of Scrap Iron and Steel in reviewing existing classifications of iron and steel scrap. On request of the American Foundrymen's Association, it cooperated in the development of a schedule of recommendations for buyers of castings, which were approved at the association's annual convention in Detroit in June, 1932. In cooperation with committees of several national electrical organizations, the electrical contract committee of this association is still actively engaged in developing standard electrical contract forms for the purchase of electrical machinery. Additional committees or groups of this association are still carrying forward work on the following projects: Simplification of steel filing equipment, with reference to color and size; simplification of laboratory glassware; and standardization of grades and colors of fine



office and record papers. The executive committee of this organization, by formal action, unanimously approved the certification and labeling programs now being developed by the Bureau of Standards. The association participates in the activities of the Central Committee on Lumber Standards, the National Committee on Wood Utilization, and the planning committee of the division of simplified practice of the Bureau of Standards.

National Association of Real Estate Boards, Herbert U. Nelson, executive secretary, 59 East Van Buren Street, Chicago, Ill. Several recent activities conducted by this association have been the development of standard forms for use in connection with transactions in real estate business. These forms have been developed by specially appointed committees composed of experienced individuals in the respective branches of the business and have been indorsed by the board of directors of this association.

National Association of Waste Material Dealers, Charles M. Haskins, secretary, Times Building, New York, N. Y. This organization has established standard classifications for waste materials including metals, scrap rubber and packing, rag stock, paper, cotton and woolen rags, which are published in its Blue Book issued once in every five years. During the past year the association adopted a revised standard classification for old metals.

National Association of Wool Manufacturers, Walter Humphreys, secretary, 80 Federal Street, Boston, Mass. Standard definitions for clean wool, shrinkage, content, and condition of wool have been adopted by this association. It cooperated with industry in the establishment of the commercial standard for sulphonated oil, standard sizes for paper cones and tubes, and the simplified-practice recommendation relating to blanket sizes conducted under the auspices of the Bureau of Standards.

National Automobile Chamber of Commerce, Alfred Reeves, vice president and general manager, 366 Madison Avenue, New York, N. Y. This organization cooperated with the National Conference on Street and Highway Safety in the preparation and promulgation of State and city traffic ordinances. A group of research associates are maintained by the American Petroleum Institute, the Society of Automotive Engineers, and the chamber carrying on a cooperative fuel research to develop the properties of gasolines and the design of engines that will

combine to give the best automobile performance.

National Board of Boiler and Pressure Vessel Inspectors, C. O. Myers, secretary-treasurer, Brunson Building, 145 North High Street, Columbus, Ohio. This board is composed of the various chief inspectors throughout the United States which have adopted the American Society of Mechanical Engineers codes for the construction of boilers and other pressure vessels. The purpose of the national board is to secure standardization in the enforcement of said codes and to advise with the ASME code committee regarding the revision and interpretation of rules governing the construction, installation, and operation of steam boilers and other pressure vessels. Unless otherwise exempted, no steam boiler or other pressure vessel built after July 1, 1921, can be used within the jurisdiction of any member of this board, unless it has been distinctly stamped with the ASME symbol and the facsimile approved by the board after having been thoroughly inspected during construction and upon completion by an inspector who has qualified in accordance with the requirements of the board.

National Board of Fire Underwriters, W. E. Mallalieu, general manager, 85 John Street, New York, N. Y. This organization with a membership of 225 stock fire-insurance companies issues reports, standard regulations and good practice requirements, and suggested codes or ordinances dealing with fire-protection equipment and the necessary safeguarding of hazards. Its standard regulations are usually passed by and recommended to it by the National Fire Protection Association. These standards which cover about 70 subjects are usually revised from time to time. During the past year the board issued standards dealing with the following subjects: Salvage, a pamphlet for fire departments giving standard methods of performing salvage work at fires; liquefied petroleum gases; installation of oil burners in stoves and ranges originally designed for solid fuels and for the storage and use of oil fuels in connection therewith; discharging flammable liquids from tank cars and installation of petroleum pipe lines; recommended good practice for standard household furniture storage warehouse construction; and a revision of suggested specifications for gasoline automobile fire apparatus. The board is joint sponsor for two sectional committees, functioning under ASA procedure.

National Bureau of Casualty and Surety Underwriters, Albert W. Whitney, associate general manager, 1 Park Avenue, New York, N. Y. The major activities of this bureau are of two general types, one pertaining to rates and rating methods and the other pertaining to the prevention of accidents in private, public, and industrial life. Its major interest in standardization is in its accident prevention work; this interest arose originally out of the necessity for having standards of safety as a basis for "schedule rating." Its standardization activities at present center about the safety codes prepared and in preparation by the American Standards Association. It is represented in the membership of some 40 ASA sectional code committees and is joint sponsor with other organizations for the following five projects: Safety code for amusement parks, safety code for conveyors and conveying machinery, safety code for machine tools, safety code for mechanical power-transmission apparatus, and safety code for woodworking plants.

National Canners Association, Frank E. Gorrell, secretary, 1739 H Street NW., Washington, D. C. In carrying out its simplification program a committee of this association cooperated with the Bureau of Standards in formulating a list of 27 sizes of cans for fruits and vegetables. A similar program for simplification of cans for canned fish products is now being given consideration by the association. For the purpose of developing improvements in the methods, materials, and products used in the canning industry this association maintains research laboratories in San Francisco, Seattle, and Washington.

National Coal Association, C. B. Huntress, executive secretary, Fifteenth and H Streets NW., Washington, D. C. All of the standardization work of this association is conducted under the auspices of the American Standards Association, of which it is a member body. It is officially represented on 10 ASA sectional committees on problems concerning the formulation of standard equipment and practices relating to the mining of bituminous coal.

National Committee on Municipal Standards, Donald C. Stone, director, 923 East Sixtieth Street, Chicago, Ill. The purpose of this committee is to encourage and generally advise in the establishment of standards in the conduct of municipal government. It has brought about the establishment of the

Committee on Uniform Street and Sanitation Records which is engaged in standardizing the work units employed for measuring work done by public works departments throughout the country, in standardizing cost accounting work, in assisting cities to establish unit cost standards, and in improving generally public works administrative methods. This committee has also organized the National Committee on Street Maintenance Economics, whose function is to set up standards in the field of street maintenance economics by which cities may know if their street maintenance work is being performed economically, when it is more economical to reconstruct than to maintain the streets, and other criteria of efficient operation. The National Committee on Municipal Standards advised with various national organizations of municipal officials and research agencies in the establishment of standard methods or model procedures.

National Committee on Wood Utilization, Axel H. Oxholm, director, United States Department of Commerce Building, Washington, D. C. This organization is composed of 200 timber owners, manufacturers, distributors, and consumers of forest products and experts in various branches of wood utilization. These members represent nearly 100 trade associations and professional and official organizations which cooperate with the committee in its program. The committee, during the past year, compiled and published booklets and pamphlets, designed to carry forward its slogan, "When you use wood, use it intelligently." Special studies were made concerning the efficient use of wood in the construction industry; application and economies of various types of house insulating materials; construction, design, care, and use of furniture; seasoning, handling, and manufacture of small-dimension lumber, with special attention to the standardization of sizes of small-dimension stock; economies in the use of treated wood, and the use of grade-marked lumber, which is stamped at the mill with a symbol designating its grade and quality. Studies have been made by the committee relating to laminated wood arches and beams, steel joints, and similar effective means of securing the best service from wood when used for construction purposes. The committee is cooperating with various States in a nationwide survey of wood waste for the purpose of ascertaining the quantity, character, and kind of nonutilized



wood available for by-products industries, which are encouraged to utilize this waste rather than to cut standing timber. Virginia, North Carolina, New York, and Maryland have been completely surveyed. The committee cooperates closely with a number of governmental agencies. It is represented on the ASA sectional committee for the preparation of specifications for wood poles.

**National Conference on Street and Highway Safety**, A. W. Koehler, secretary, 1615 H Street, N.W., Washington, D. C. This conference was organized in 1924 by Hon. Herbert Hoover, then Secretary of Commerce, to reduce the heavy toll of accidents in our streets and highways. Its work has developed progressively through extended committee studies and general conferences held in 1924, 1926, and 1930. In this work the conference and its committees have had the constant cooperation of public officials, associations, and individuals from all parts of the country concerned in the problems of motor traffic. The third national conference held in May, 1930, was attended by delegates from nearly every State in the Union, including official representatives appointed by the governors of 42 States. It reviewed the recommendations of both the previous conferences and of the committees which during the intervening three years had developed reports and as a result presented findings and recommendations, among which were the following: A uniform vehicle code for State enactment comprising a uniform motor vehicle registration act, a uniform motor vehicle antitheft act, a uniform motor vehicle operators' and chauffeurs' license act, and a uniform act regulating traffic on highways; a model municipal traffic ordinance; manual on street traffic signs, signals, and markings; traffic accident statistics; measures for the relief of traffic congestion; protection of railway grade crossings and highway intersections; and maintenance of the motor vehicle. In the above uniform act regulating traffic on highways are included requirements on the equipment to be supplied automobiles and trucks, such as number and illumination efficiency of lamps, provision and efficiency of horns, mirrors, windshield wipers, brakes, mufflers, etc., limitations on width and height of vehicles. A joint committee of representatives of the American Association of State Highway Officials and the national conference is now

preparing a recommended revision and consolidation of the rural sign manual of the former organization and the street sign and signal manual of the latter.

**National Conference on Weights and Measures**, F. S. Holbrook, secretary, Bureau of Standards, Washington, D. C. One of the principal activities of this conference is the development of codes of specifications, tolerances, and regulations for commercial weighing and measuring devices, conducted in cooperation with the Bureau of Standards. The conference has adopted 26 codes, one of which is still in tentative form awaiting final action. The conference codes are recommended by the Bureau of Standards for adoption by the States, and these, as well as the reports of the proceedings of each meeting of the conference are published in the miscellaneous series of the bureau. The conference has also adopted a model State law on weights and measures, and from time to time indorses standard methods of test for commercial apparatus. Manufacturers of weighing and measuring devices and representatives of industries affected by the actions of the conference participate in the conference meetings, and contribute to the discussions leading up to the adoption of the conference codes.

**National Cottonseed Products Association (Inc.)**, Earl S. Haines, executive vice president, 1913 Sterick Building, Memphis, Tenn. This association has formulated and adopted standard definitions of grade and quality of cottonseed, which are practically the same as those contained in Service and Regulatory Announcements No. 133, promulgated by the United States Secretary of Agriculture. The association also has formulated and adopted standard definitions of grade and quality cottonseed, peanut and coconut oils (crude and refined); cottonseed and peanut cake and meal, cracked cake and screenings, whole pressed cottonseed and peanuts, cottonseed hulls and linters, soap stock and acidulated soap stock. It has also adopted standard methods of chemical analyses of cottonseed, cottonseed hulls, cottonseed cake and meal, and crude and refined oils, including coconut and soybean. In matters of trading rules it cooperates with the American Feed Manufacturers' Association and the New York Produce Exchange and other commodity exchanges. The trading rules provide arbitration facilities for the use of the members in settling differences

between them on definitions, terms of contract, and interpretations of these. In order to make its rules, definitions, and analyses effective the association will expel any member from the organization who has been found guilty of misbranding or adulteration.

National Crushed Stone Association, A. T. Goldbeck, director, bureau of engineering, 1735 Fourteenth Street NW., Washington, D. C. This association cooperated with committees of the American Society for Testing Materials, the American Concrete Institute, and the American Railway Engineering Association in the standardization of methods of tests and specifications for aggregates for different construction purposes. It has also cooperated with other mineral aggregates associations in reviewing Federal specifications relating to these items. Through its research advisory committee, this association collaborated in the standardization of wire diameters for use in commercial screens. At the present time it is continuing its activities in connection with the preparation of a standard set of sizes for aggregates for various purposes.

National District Heating Association, D. L. Gaskill, secretary, 603 Broadway, Greenville, Ohio. This association took an active part during the past year in the work of the ASA sectional committees on code for pressure piping and on standardization of dimensions and material of wrought-iron and wrought-steel pipe and tubing, on which committees it is officially represented. Also, within the past year, the association published a new edition of its handbook, which provides an authoritative and complete manual of practice for the use of those actively engaged in district heating work.

National Education Association, J. W. Crabtree, secretary, 1201 Sixteenth Street, NW., Washington, D. C. This association has cooperated with other organizations, under the procedure of the American Standards Association, in the establishment of the American building exits code and the code for the lighting of school buildings. A book entitled "School House Planning," prepared and published by this organization, gives recommendations on the determination of schedule of rooms, choice of general plan, standard illumination requirements, planning and construction requirements to provide safety against fire, general requirements of a construction specification, planning gymnasiums, etc.

National Electric Light Association, Bernard F. Weadock, executive direc-

tor, 420 Lexington Avenue, New York, N. Y. Included among the active standardizing committees of this association are the following: Accident prevention, electrical apparatus, hydraulic power, meter, foreign systems coordination, overhead systems, prime movers, underground systems, and wiring. Its committee on codes and standards has formulated certain principles and practices in the standardization field which have been issued in pamphlet form. During recent years the association's electrical apparatus committee prepared and issued a report which is intended to serve as an aid in the preparation of purchase specifications covering metal-clad switch gear. Two former publications deal with specifications, namely, guides for specifications covering electrical apparatus and equipment and guides for specifications covering power station matters and control equipments. The association jointly with the National Electrical Manufacturers Association has recently published a table of preferred voltage ratings and a recommended practice for terminal lugs used with electrical apparatus. This association is joint sponsor for the ASA sectional committee on code for electricity meters. As a member of the electrical standards committee under the ASA procedure it also exercises sponsorship on a number of electrical standardization projects. The association is represented on some 50 sectional committees under other sponsorships.

National Electrical Manufacturers Association, A. W. Berresford, managing director; C. M. Cogan and A. B. Smith, secretaries, codes and standards committee, 570 Lexington Avenue, New York, N. Y. The committee concerned with standardization activities is the codes and standards committee, which cooperates with the individual sections in the formulation of standards for the manufacture of electrical apparatus, materials, and devices. Approximately 200 different standardization projects are involved. The association is joint sponsor or sole sponsor for six sectional committees functioning under the rules of procedure of the American Standards Association, as follows: Electric welding apparatus; industrial control apparatus; frame dimensions of electric motors; specifications for rolled threads for screw shells of electric sockets and lamp bases; specifications for trolley, storage battery, and combination type locomotives for coal mines; and terminal markings for electrical apparatus.



The association is represented on the Electrical Standards Committee of the American Standards Association, which has taken over the sponsorship of several sectional committees, formerly held jointly. The association has issued, and keeps under constant revision, the following publications covering standards for the manufacture, performance, and test of electrical apparatus and supplies. One publication, Apparatus Standards, includes the following standards: Electric tools, electric welding, electrical measuring instruments, and storage batteries. Another, Supply Standards, includes the following: Air circuit breakers, attachment plugs, fuses, knife and inclosed switches, lamp receptacles and sockets, metal molding, nonmetallic flexible conduit, outlet boxes, overhead trolley line materials, signalling apparatus, and snap switches. Other standards published separately covering particular branches of the industry are: Industrial control standards, laminated phenolic products standards, motor and generator standards, panel board and distribution board standards, switch gear standards, transformer standards, and vulcanized fiber standards. In addition, instruction books on the proper installation and care of apparatus and informative pamphlets are published by this association. The association encourages the members to build their apparatus to association standards, but conducts no activities concerned with the compliance of such apparatus with specifications.

National Engineering Inspection Association, J. D. Stoddard, president, 554 Bagley Avenue, Detroit, Mich.; B. H. Witherspoon, secretary, Stevenson and Locust Streets, Pittsburgh, Pa. At its last annual meeting held in April, 1932, this association revised its first edition of Tentative Methods of Procedure for Inspection of Materials and adopted as "standard" those covering the inspection of the following: Structural steel for buildings and bridges (including mill, shop, and field inspection); tie and girder rails and accessories; steel plate pipe; hot rolled or drawn steel and iron pipe; boiler and fire-box steel; cast-iron pipe and specials and cement. Tentative methods were retained for the inspection of concrete and timber piles, poles, and ties. Several committees are still at work on the preparation of methods of inspection of a number of other construction materials, including reinforcing steel, at mill and warehouses. In the work on reinforcing steel inspection, the com-

mittee is cooperating with the Concrete Reinforcing Steel Institute. Through association and cooperation with Federal, State, and municipal officers and architects, engineers and contractors associations and societies, this association is actively promoting the use and adoption of specifications for inspection services.

National Fire Protection Association, Franklin H. Wentworth, managing director; Robert S. Moulton, technical secretary, 60 Batterymarch Street, Boston, Mass. The more important standardization projects brought to tentative or final conclusion by this association during the past year deal with the fire and explosion hazards and methods of protection of the following: Blower systems; flour and feed mills; trolley busses; first aid fire appliances; oil burning equipments; flammable liquids ordinance; peddling gasoline from tank trucks; salvaging operations; forest fire fighting equipment; garages; city gas; compressed and liquefied gases; compressed gas (other than acetylene) for house lighting and heating; gasoline vapor gas machines, lamps, and systems; marine fire hazards; protection against lightning; protection of records; and water charges. The association is sponsor or joint sponsor for seven sectional committees functioning under American Standards Association procedure, and is officially represented on 18 additional ASA committees.

National Founders Association, J. M. Taylor, secretary, 29 South LaSalle Street, Chicago, Ill. This association is joint sponsor, with the American Foundrymen's Association, for the safety code for the protection of industrial workers in foundries, approved by the American Standards Association as American standard B8-1932. It has issued a booklet entitled "Minimum Standards of Foundry Apprenticeship," which sets forth the requirements for thorough apprenticeship training and the steps necessary to develop a 4-year foundry schedule.

National Hardwood Lumber Association, L. S. Beale, secretary, 2408 Buckingham Building, Chicago, Ill. The rules of the National Hardwood Lumber Association are considered standard in both the domestic and foreign trade for the measurement and inspection of hardwood lumber, cypress, veneers, and thin lumber. A copy of these rules may be had on application to the association offices in Chicago. The association maintains licensed and bonded inspectors in the principal con-

suming and producing districts of the United States and Canada who are authorized to issue certificates of inspection on hardwood lumber and cypress, the correctness of the grades and measurement shown on the certificate being guaranteed by the financial resources of the association.

National Hay Association (Inc.), Fred K. Sale, secretary-treasurer, 600 Board of Trade, Indianapolis, Ind. Standard definitions of grades for baled hay and straw, formulated by this association, have been adopted by numerous hay exchanges and associations throughout the country. This association will examine any inspector being employed by an organization using the association rules of grading upon request of the employing organization. The association will license the approval of any inspector who has been found to qualify under its rules.

National Lightning Rod Manufacturers Association, E. R. Stotts, general manager, care of Dodd & Struthers, Des Moines, Iowa. In the code for the protection against lightning published by the Bureau of Standards are included standards and specifications of lightning rods formulated by this association. A constant effort is being made by this association in simplifying styles, sizes, and methods of installing lightning rods with the result that the different kinds and styles of lightning rods formerly in use have been reduced to a minimum.

National Lime Association, Norman G. Hough, president and general manager, 927 Fifteenth Street NW., Washington, D. C. This organization has adopted specifications for the lime treatment of earth roads; it has issued proposed specifications for lime stucco and lime plastering, and has promulgated standard formulas for whitewash and cold-water paints. It has issued recommended practices in the use of lime in concrete and in lime and lime-cement mortar. It is cooperating with the Building Code Committee of the United States Department of Commerce, the National Board of Fire Underwriters, and the larger cities of the country in a revision of building codes, and is also cooperating with the Association of Official Agricultural Chemists in the formulation of standard definitions for the several terms used in connection with the use of lime in agriculture. The association is a member of the American Concrete Institute, and is cooperating with that organization in research and investigations relative to the use

of lime in concrete. It maintains membership in the American Society of Municipal Engineers and the American Society for Testing Materials and is active in the work of these organizations in developing standards and tests involving the various uses of lime.

National Luggage and Leather Goods Manufacturers Association, John B. McEwan, executive secretary, 30 North La Salle Street, Chicago, Ill. The committee on simplification of this association sponsored the movement for the simplification of trunk sizes which resulted in the formulation and adoption by the industry of the simplified-practice recommendation relating to box sizes of wardrobe, dress, steamer, and hand trunks. The committee has also recommended to the industry the establishment of a limited list of standard sizes and dimensions for ladies' suitcases.

National Lumber Manufacturers Association, Wilson Compton, secretary-manager, 1337 Connecticut Avenue, Washington, D. C. This association takes a leading part in the activities of the Central Committee on Lumber Standards and the Consulting Committee on Lumber Standards, and is represented on the Hardwood Consulting Committee which cooperated with the Central Committee on Lumber Standards in the formulation of the American standard basic provisions for hardwood factory lumber. It maintains representation on 14 ASA sectional committees. In cooperation with other branches of the lumber industry, architects, and millwork manufacturers, this association has developed standard designs for wood moldings, known as the 7,000 series of American standard moldings, revised 1931. The association licenses the use of its "tree mark" on lumber in conjunction with the grade-mark, trade-mark, or species mark of licensed mills that conform to American lumber standards, the lumber being guaranteed by the National Lumber Manufacturers Association to the first unloading buyer to conform to such specifications as may be indicated thereon. It cooperated with other units of industry in the establishment and acceptance by industry of commercial standards for grades for hickory golf shafts, aromatic red-cedar closet lining, red-cedar shingles, and plywood, under the auspices of the Bureau of Standards. The association is now engaged in developing plans for standardized prefabricated houses, standards for the proper specification



and use of lumber and timber in buildings and general construction, and standard wood structural design data.

National Metal Exchange (Inc.), J. J. Murphy, secretary, 27 William Street, New York, N. Y. Standard contract forms for trading in tin, copper, and silver have been adopted by this exchange. During the past year it also adopted the new contract for copper known as the American standard contract, which provides for deliveries from licensed and designated warehouses in the United States.

National Municipal League, Russell Forbes, secretary, 309 East Thirty-fourth Street, New York, N. Y. This organization was responsible for the initiation of the National Committee on Municipal Standards and the National Committee on Municipal Reporting. The former acts as an advisory body in the work of installing standard accounting and reporting forms in various cities for measuring the results of street sanitation. The latter committee has published a report entitled "Public Reporting" in which are included specifications for the guidance of department heads in a city in preparing periodic or annual reports. The league formulates, publishes, and distributes model laws, including bond law, budget law, city charter, county manager law, election administration system, registration system, and State constitution. These are intended to serve as standards and to stimulate uniformity in State, county, and city legislation. One of the committees of the league is continuing its work in devising a model administrative code to accompany the model city charter as the basis for legislation to inaugurate the city-manager plan of government. During the past year a committee was appointed to prepare a model law on special assessments for recommended adoption by State legislatures for application to local governments.

National Paint, Oil, and Varnish Association (Inc.), George V. Horgan, general manager, 2201 New York Avenue NW., Washington, D. C. (For standardization and simplification activities of this association, see sketch on p. 181.)

National Paving Brick Association, G. F. Schlesinger, chief engineer and managing director, National Press Building, Washington, D. C. This association continued its cooperation with the American Road Builders' Association

and the American Society of Municipal Engineers in the preparation and adoption of standard specifications for vitrified-brick pavements. It initiated the movement which resulted in the simplified-practice recommendation for paving brick and has made a regular annual survey at the request of the United States Department of Commerce of the paving-brick industry with a view to further simplification of varieties. The association is represented on the committee on brick and on the committees on paving materials of the American Society for Testing Materials. It is also represented on the committee on design, the subcommittee on road types, and the project committee on fillers for brick and block pavements of the Highway Research Board of the National Research Council.

National Petroleum Association, Fayette B. Dow, general counsel, Munsey Building, Washington, D. C. This association conducts a department of standards and tests, with groups in all of the petroleum refining centers in which members of the association are located. The chief function of this department is to secure more uniform testing methods and results among the member companies. Through this department the association cooperates in the preparation of standard methods of tests and specifications for petroleum products with the American Petroleum Institute, the American Society for Testing Materials, the Society of Automotive Engineers, and the Federal Specifications Board.

National Raw Silk Exchange (Inc.), A. H. Korndorfer, secretary, 58 Water Street, New York, N. Y. This organization has adopted standards and specifications for various grades of raw silk deliverable against contracts on the exchange. The specifications provide for quality and auxiliary tests for grading of raw silk and also a standard classification for white and yellow silk.

National Ready Mixed Concrete Association, V. P. Ahearn, executive secretary; Stanton Walker, director of engineering, Munsey Building, Washington, D. C. Standardization activities of this association have consisted principally of cooperation with national organizations in the development of standard specifications for ready-mixed concrete. During the past year this association cooperated with a committee of the American Society for Testing Materials in the preparation of a

preliminary draft relating to a proposed tentative specification covering materials, quality, testing, acceptance, etc., of ready-mixed concrete. Much of the information on which this specification is based was developed by this association. At the present time the association is collecting data relating to factors affecting the production, use, and quality of ready-mixed concrete.

National Recreation Association, Howard S. Braucher, secretary, 315 Fourth Avenue, New York, N. Y. Committees of this association are endeavoring to establish standards and specifications for playground apparatus and equipment for use in playgrounds throughout the country. In cooperation with local recreation executives this association has prepared a preliminary draft relating to a practical set of standards by which cities might measure their own community recreation service.

National Research Council, W. H. Howell, chairman, 2101 Constitution Avenue NW., Washington, D. C. The following activities of the council, including certain general activities as well as work of several of its technical divisions, have to do with standardization. At the request of the International Research Council and under the auspices of the National Academy of Sciences, the National Research Council has prepared the International Critical Tables of Numerical Data, Physics, Chemistry, and Technology in seven volumes. The National Research Council has also published a list of industrial research laboratories, about 1,600 of which have been reported, in which much developmental work leading toward the standardization of industrial processes is being carried on, a list of the scientific societies of the United States and Canada, and other directories and compendia of general scientific information. The National Research Council cooperates with the Bureau of Standards by administering the funds contributed by certain industrial corporations for special investigations to be conducted by the bureau, including investigations of insulating materials, deterioration of paper, gumming of petroleum, acoustics, etc. The committee on the physics of the earth is encouraging investigations on gravity and deflection from the vertical, the figure of the earth, variation in latitude, field methods for detecting unhomogeneities in the earth's crust, and other similar problems. Cooperating with the division of engineering and industrial research of the council are

12 national engineering organizations which are intrinsically interested in standardization. Among direct agencies of this division the American Bureau of Welding is conducting investigations on welding wire specifications, the welding of pressure vessels, structural-steel welding, the welding of rail joints, and standard tests for welds, and has issued manuals on the training of welding operators. The Highway Research Board is concerned with standards for the character and use of road materials, with the structural design of roads, and with the compilation of a safety code for automobile brakes and brake testing. Other committees of this division have contributed to the standardization of processes and specifications in electrical insulation, industrial lighting, and heat transmission, in the latter case through the issuance of test codes for thermal insulation at different ranges, and in the standardization of nomenclature and definitions of terms and units. The division of chemistry and chemical technology of the council acts as the American section of the International Union of Chemistry and participates in the activities of the Union relating to the work of its committees on the terminology of inorganic, organic, and biological chemistry, on chemical elements, on physicochemical symbols, on physicochemical standards, and on tables of constants. This division, in cooperation with the American Chemical Society, has published a list of ring systems used in organic chemistry. Committees of the division of geology and geography have encouraged the keeping of systematic drilling records and specimens of core materials from wells, and have studied methods for the improvement of gravity measurement, for the measurement of geological time by atomic disintegration, for the recording of field data of earthquakes, and for shore line and mean sea-level determinations. This division is represented in the Advisory Committee of the Board of Surveys and Maps of the Federal Government. Committees of the division of medical sciences have developed methods of classifying blood for purposes of transfusion, have formulated standard methods for the agglutination test in the diagnosis of infectious abortion. The division is also directing research upon the production of new standard narcotic drugs for use in place of the present habit-forming derivatives of opium and related compounds. Committees of the division of biology and agricul-



ture are engaged in the standardization of the nomenclature of unicellular organisms and of names and species definitions of medicinal plants. The Commission on Standardization of Biological Stains, now an independent body, was developed from earlier work of this division of the council.

National Retail Dry Goods Association, Channing E. Sweitzer, managing director, 225 West Thirty-fourth Street, New York, N. Y. Several divisions of this association are actively carrying forward work in the field of standardization. Through its store managers' division, this association has simplified and standardized the sizes of supplies used for wrapping and packing merchandise, including paper bags, folding boxes, set-up boxes, and corrugated boxes. Simplification of other supplies and the development of construction and performance specifications for wrapping and packing supplies are now being carried on. Organization, layout, and operation methods for workrooms in department stores also have been standardized in a manual issued by this division. The merchandise managers' division is working with manufacturers and retail buyers to secure the adoption of standard terms and definitions as to what constitutes "first quality, perfect, imperfect, irregulars, substandards, and seconds" merchandise. This division is at the present time cooperating with the International Association of Garment Manufacturers in establishing standard size folds for men's shirts in order to enable stores to adopt standard size shirt cases and drawers in store fixtures. The association, through this division, initiated the movement for the labeling of wool blankets which resulted in the establishment of the commercial standard prepared and published under the auspices of the Bureau of Standards. As a result of meetings between committees of the association and manufacturers, a set of standard sizes was adopted for women's and misses' ready-to-wear garments. The association maintains and operates the Better Fabrics Testing Bureau as a service laboratory for its member stores. This laboratory offers a commercial testing service to retail merchants and manufacturers. It specializes in the testing of textile products, leathers, and furs. In addition to serving members of this association, this bureau undertakes specific tasks in establishing specifications for textile merchandise—both in manufacturing specifications and size standards for utility types of ready-to-wear goods. During the past year progress was made in establishing size

standards for men's, women's, and children's rayon knit underwear, and also a standard for classification of pure dye rayon fabrics. A distinctive project carried on at present in the laboratory is the study of rendering certain kinds of merchandise repellent to moisture and wet soil. A plan of testing merchandise for certification and labelling has been followed on a limited scale for two years. This service to manufacturers is still in an experimental state as it is not known as yet how successfully a plan of this kind can be practiced in the textile industry. A program has been carried on in cooperation with the largest producer of rayon yarns for more than a year, with results satisfactory to all involved from the yarn producer to the ultimate consumer, who has the privilege of returning merchandise for full refund because of defects—if it bears a tested quality label sponsored by the bureau.

National Retail Hardware Association, H. P. Sheets, managing director, Meyer-Kiser Bank Building, Indianapolis, Ind. This organization cooperated with various industries in establishment of simplified practice recommendations relating to loaded paper shot shells, builders' hardware, files, rasps, paint and varnish brushes, garden hose, forged tools, cut tacks and cut nails, conducted under the auspices of the Bureau of Standards.

National Retail Lumber Dealers Association, Adolph Pfund, secretary-manager, 326 West Madison Street, Chicago, Ill. In order that lumber may be properly certified by retailers when sold to consumers, this association is carrying on an active campaign in encouraging its member companies to adhere to the standards for lumber set forth in Simplified Practice Recommendation R16 to use tally cards by which car contents are described in terms of American lumber standards. It is also continuing its efforts to recommend to all lumber manufacturing associations the inclusion of a moisture content requirement in lumber grading rules.

National Safety Council, W. H. Cameron, managing director, 20 North Wacker Drive, Chicago, Ill. Practically all of the standardization work of this council is carried on under the procedure of the American Standards Association. It is sponsor or joint sponsor for 16 safety codes, 10 of which have been approved and published. It is also represented on the sectional committees for 36 other safety codes functioning under ASA procedure. The publication and regu-

larized revision of the pamphlets in the Safe Practices Pamphlet series comprise some of the most important activities of the council pertaining to work of an engineering and standardization character. Each year new pamphlets are added to this series, which now includes 98 pamphlets pertaining to all industries, and 52 pamphlets pertaining to specific industries. During the past year the council published pamphlets relating to the following subjects: Use and care of hoisting chains; safe operation of pulverized-coal systems; industrial power departments; safe practices in handling compressed gases; safe practices in heat treating; cement rock quarrying and crushing; safe practices in handling bunker coal; testing, care, and use of linemen's rubber protective equipment; and safe practices in delivery of ice. Four research committees functioning under the supervision of the American Society of Safety Engineers, engineering section of the National Safety Council, are making studies of low voltage electrical hazards, static electricity, woodworking circular saws, and gasoline blow torches. It is cooperating with the National Fire Protection Association in the work on gasoline blow torches.

National Sand and Gravel Association, V. P. Ahearn, executive secretary; Stanton Walker, director, engineering and research division, Munsey Building, Washington, D. C. The principal standardization activities of this association consist in cooperating with national organizations, such as the American Concrete Institute, American Railway Engineering Association, and the American Society for Testing Materials, in the development of standard specifications and test methods for sand and gravel. In cooperation with the National Crushed Stone Association and the National Slag Association, it has formulated recommended standard sizes of aggregates and specifications covering different uses of aggregates. At the present time, the association is collaborating with manufacturers of wire screen in standardizing and simplifying sizes of wire used in the manufacture of wire screens for aggregate production. The association operates a research and testing laboratory for the purpose of developing standard practices in the use of aggregates and to make investigations of products of member plants.

National Scale Men's Association, C. L. Richard, secretary, Bureau of

Standards, Clearing Station, Chicago, Ill. This organization is composed of a technical group of men actively engaged in the design, production, installation, maintenance, testing, and operation of weighing machines. During the past year this association adopted standard codes relating to rules for the maintenance and transportation of track scale test weight cars and a definition of a standard test of a railway track scale.

National School Supply Association, J. W. McClinton, executive secretary, 176 West Adams Street, Chicago, Ill. This association initiated the movement which resulted in the establishment of a simplified list of standard colors for school furniture conducted under the auspices of the Bureau of Standards. It has inaugurated a certification and labeling program whereby all janitor supplies used in schools will be properly labeled as conforming to certain standards promulgated and adopted by the association. The manufacturers or distributors of janitor supplies may submit samples of their regular janitor supply products to the association for certification purposes. These samples are tested in the laboratory of the association. When the samples tested conform to the different standards established, quality labels are issued and the companies are privileged to use the certification seals. The association also makes use of labels to identify school furniture complying in color with the standards established by the industry under the auspices of the United States Department of Commerce.

National Singletree Institute, John W. Gregg, secretary, care of Gregg Manufacturing Co., St. Paul, Minn. Working in cooperation with the Bureau of Standards and other units of the industry this organization formulated and established standard sizes for singletrees, doubletrees, and neck yokes which have been promulgated in the form of simplified practice recommendation by the Department of Commerce. The efforts of this institute are now directed toward a further reduction in size of the items now listed in the recommendation.

National Slag Association, H. J. Love, manager, 1449 Leader Building, Cleveland, Ohio. Specifications covering standard definitions of slag, classification requirements on unit weight of slag for various types of highway construction, and requirements on screen grading of granulated slag for brick cushion and for slag base have been



formulated and adopted by this association. Through the work of a joint technical committee composed of representatives of the National Crushed Stone Association, the National Sand and Gravel Association, and this association, it is attempting a standardization of sizes for mineral aggregates. The association maintains a research laboratory where tests are being made relative to the determination of the properties of concrete made with 32 different aggregates.

National Soybean Oil Manufacturers Association, Whitney H. Eastman, president, box 603, Milwaukee, Wis. Specifications for the purity and quality of crude domestic raw soybean oil have been adopted by this association. The methods of analysis conform to those of the American Society for Testing Materials' specifications for soybean oil. This association has also adopted standard trading rules and a code of ethics.

National Tent and Awning Manufacturers Association, Joseph E. Dilg, president, 116 South Fourth Street, St. Louis, Mo. In cooperation with the Waterproofers Association of the United States and the Cotton-Textile Institute, this association adopted standards of practice covering the basis and method of marking cotton fabric, tents, tarpaulins, and canvas, either waterproofed or untreated. These standards, which have been set forth in Commercial Standard CS28-32 published and promulgated by the Bureau of Standards, provide that the above-mentioned articles shall be marked with the actual untreated gray goods weight only on the basis of the square yard. At the present time the association is sponsoring the movement for a simplification and standardization of patterns used in tent and awning fabrics.

National Wall Paper Wholesalers' Association, Justin P. Allman, president, 1522 Chestnut Street, Philadelphia, Pa. The standardization committee of this association cooperated with the Wallpaper Association of the United States in the establishment of the commercial standard for wall paper covering quality requirements, fade-proof characteristics, etc.

National Warm Air Heating Association, Allen W. Williams, managing director, 3440 A. I. U. Building, Columbus, Ohio. In cooperation with a committee composed of blower manufacturers, this association's code committee is actively engaged in the preparation of a set of rules governing the installation of mechanical heating in

residences. The association has issued the eighth edition of its standard code for regulating the installation of gravity warm-air furnaces in residences. Any heating contractor who has pledged himself to install warm-air heating systems in accordance with the last-mentioned code is permitted to use the association's emblem signifying that the installation is in accordance with the requirements of the standard code.

National Wholesale Druggists' Association (Inc.), E. L. Newcomb, secretary, 51 Maiden Lane, New York, N. Y. This organization sponsored the movement for the packaging of razor blades and flash-light batteries which resulted in the establishment of simplified practice recommendations covering these items promulgated by the Department of Commerce. It also cooperated with the Bureau of Standards in the formulation of the commercial standard for clinical thermometers. The statistical division of this association is continuing the issuance of bulletins relating to standards covering distribution, cost analysis, and balance-sheet account classification.

National Wholesale Grocers' Association of the United States, M. L. Toulme, secretary, 99 Hudson Street, New York, N. Y. This organization takes an active part in the establishment of simplified practice recommendations promulgated by the Bureau of Standards in connection with sizes of containers for canned foods, and cooperates with the Food and Drug Administration of the United States Department of Agriculture in the enforcement of the several Federal laws enacted by Congress relating to standards for canned foods.

National Wiping Cloth Standardization Association, Charles M. Haskins, secretary, Times Building, New York, N. Y. This association functions as a division of the National Association of Waste Material Dealers. It cooperates with various elements in industry for the purpose of making available to consumers wiping cloths which are guaranteed to comply in quality with certain standard specifications. In order to bring this about the association is promoting a guarantee plan which provides that every member of the association may continue to sell his wiping cloths under any classification or designation that he may see fit to use. At the same time certain standard classifications have been set up under which cloths are sold with a guarantee to the consumer that they are packed in accordance with the

association's standard specifications relating to quality. These cloths are known as NAWMD Certified Wipers, and each member desiring to handle wiping cloths under the guarantee will be furnished by the association with a certificate, bearing a permit number and a standard tag, which may be placed in or attached to bales or packages shipped.

New England Council, Dudley Harmon, executive vice president, Ray M. Hudson, industrial executive; Ralph H. Underwood, agricultural executive; Statler Building, Boston, Mass. In the interest of national prosperity the council has for its primary objects, among other things the development of industry through standardization and research, and of agricultural prosperity through the farm marketing program inaugurated about six years ago. This program calls for the grading of produce in accordance with official State grades established and promulgated by the commissioner of agriculture of each State. Goods packed in accordance with these grades may be identified by means of the New England quality farm products label, which is identical for the various States with the exception of the State name. The commissioner of agriculture establishes grades at the request of the growers of his State, calling them into meetings to aid him in determining what the requirements of any particular grade should be. To protect the reputation of the label, each State department of agriculture maintains an inspection service with trained field men whose duties are to examine graded and labeled products in the ordinary channels of trade to see that they meet the requirements. The market for graded and labeled goods is promoted by instructing the housewives in the meaning of the label and showing them in what way it is to their advantage to use labeled goods. The use of grades is not compulsory on the producer, but anyone desiring to use the New England label must grade his products properly, the right to use this label being taken away if his product falls below the requirements of the grade.

New York Produce Exchange, W. C. Rossman, secretary, 2 Broadway, New York, N. Y. Committees have been appointed by the exchange to regulate the inspection, quality, and standards of the various commodities handled by its members. In the case of cottonseed products samples are submitted to the bureau of chemistry of the ex-

change for analysis, are tested in accordance with official methods adopted jointly by the National Cottonseed Products Association and the American Oil Chemists' Society, and graded accordingly. The bureau of chemistry of the exchange employs the methods adopted by the American Oil Chemists' Society, or those methods adopted by the Association of Official Agricultural Chemists for testing animal and vegetable oils, waxes, and fats. In testing flours, the methods followed are those of the American Association of Cereal Chemists.

Northeastern Retail Lumbermen's Association, Paul S. Collier, secretary, 604 Case Building, Rochester, N. Y. This organization cooperated in the lumber standardization movement which resulted in the formulation of the American lumber standards conducted under the auspices of the Central Committee on Lumber Standards and promulgated by the United States Department of Commerce. It cooperated with the Bureau of Standards and the industry in the establishment of the commercial standard for fiber insulating board. This association has set up in the city of Boston an agency for inspecting lumber which has previously been on the yard, or has been remanufactured while on the dealer's yard. This agency, known as the Northeastern Lumber Service (Inc.), is working in close cooperation with the associations of lumber manufacturers to the end that all lumber sold shall conform as closely as possible with established grading rules.

Northern Hemlock and Hardwood Manufacturers Association, O. T. Swan, secretary-manager, Oshkosh, Wis. This association has formulated standard grading rules for hemlock and tamarack lumber which are in accordance with American lumber standard grading rules for yard lumber. The organization also formulates and issues rules governing the grading and inspection of white cedar shingles. For hardwood lumber the association has adopted the grading rules of the National Hardwood Lumber Association. It maintains a system of branding and grade marking by which the licensed member firms may use the association's brand in addition to the indication of grade on hemlock lumber shipped in accordance with the association grades. In addition, the licensed member firms are permitted to use association car certificates by which the manufacturer certifies the original tally and inspection of a particular car of hardwood or softwood



lumber and an attached coupon guarantees an impartial association inspection in case of a claim on grade or tally by the consumer.

Northern White Cedar Association, N. E. Boucher, secretary, 703 Lumber Exchange, Minneapolis, Minn. During the past year the activities of this association and those of the Western Red Cedar Association were consolidated. Through the work of its committees this association has, in the course of the past year, issued official manufacturing specifications governing the manufacture of northern white cedar poles (16 feet and longer) and specifications for preservative treatment of western red cedar and northern white cedar poles.

Oak Flooring Manufacturers' Association of the United States, W. L. Claffey, secretary, 604 Dermon Building, Memphis, Tenn. Standard oak-flooring grading rules have been established by this association for the entire oak-flooring industry. Through representation on committees working under the auspices of the American Standards Association, this association assisted in the preparation of the American standard safety code for woodworking plants.

Paperboard Industries Association, G. R. Browder, general manager, 608 South Dearborn Street, Chicago, Ill. This association has cooperated with the United States Department of Commerce and other organizations in the development of standard sizes for boxes for canned foods, coffee, and ice cream, and also in connection with paper-board boxes used by department stores. The association has published a booklet known as the Paperboard Industries Association Booklet of Standards, containing the standard-gage lists for box board, adopted by manufacturers of box board, containers, and folding boxes, which includes standard mill specifications covering the purchase of box board. It has also published an illustrated container handbook, which includes standard nomenclature used to describe corrugated and solid fibre containers and component parts.

Pine Institute of America (Inc.), C. F. Speh, secretary, Barnett National Bank Building, Jacksonville, Fla. Standardization of woods operations and crude-turpentine-gum processing, undertaken in connection with studies being made by various Federal Government agencies and the industry, constitute important activities of this association. The institute has adopted the standard grades for rosin provided by the Federal naval stores act and

the specifications of the American Society for Testing Materials. The institute is cooperating with barrel-stave manufacturers in an effort to standardize the rosin barrel by a further tightening of the specifications as adopted by the Naval Stores Boards of Trade.

Plumbago Crucible Association, C. H. Rohrbach, secretary, 90 West Street, New York, N. Y. The members of this industry have agreed to use standard sizes of brass melting pots in connection with the standard form of spout used in tilting furnace crucibles adopted by this association. It served as joint sponsor with the American Foundrymen's Association for the sectional committee on outside dimensions of crucibles for melting furnaces in nonferrous foundries functioning under ASA procedure.

Portland Cement Association, Edward J. Mehren, president; William M. Kinney, vice president and general manager, 33 West Grand Avenue, Chicago, Ill. Specifications for Portland cement, concrete and concrete aggregates, construction of buildings, highways, and other structures have been formulated by this organization in cooperation with various technical societies and trade associations. It collaborated with the Cast Stone Institute in the preparation of an architect's specification for cast stone and with the American Concrete Institute in the formulation of specifications for cast stone and concrete burial vaults. It also assisted the American Society for Testing Materials in the development of specifications for concrete masonry units. The association cooperated in the establishment of the simplified-practice recommendation for concrete building units conducted under the auspices of the Bureau of Standards. It conducts a research laboratory engaged in studying concrete and concrete materials and maintains three research associates at the Bureau of Standards investigating the constitution and hardening of Portland cement. Membership in the Portland Cement Association is contingent on the members' product conforming to the specifications of the American Society for Testing Materials. It is officially represented on seven ASA sectional committees.

Pulverized Fuel Equipment Association, F. H. Daniels, president, 9 Neponset Street, Worcester, Mass. In cooperation with the National Fire Protection Association and the National Board of Fire Underwriters, this organization is vitally interested in

bringing about standardization of the rules for the installation and operation of pulverized fuel equipment. The association is officially represented on the sectional committee on safety codes for the prevention of dust explosions functioning under the rules of procedure of the ASA.

Pyroxylin Plastics Manufacturers' Association, John E. Walker, secretary, 1001 Fifteenth Street, Washington, D. C. This association has adopted standards for pyroxylin sheets, rods, and tubes covering standard sizes, dimensions, and tolerances. These standards were prepared by the trade customs committee of the association.

Radio Manufacturers Association (Inc.), Bond Geddes, executive secretary, 307 North Michigan Avenue, Chicago, Ill.; Virgil M. Graham, chairman, standards section, 100 Carlson Road, Rochester, N. Y. Practically all of the work relating to standardization is carried on under the auspices of the standards section composed of several standards committees dealing with various subjects pertaining to the radio field. At the present time the committees are actively engaged on a number of subjects, including cooperative work with the Society of Automotive Engineers, on problems of automotive radio, a new system of vacuum tube numbering, and a number of items on component parts. During the past year the association adopted new and revised standards for the following subjects for inclusion in its publication entitled "RMA Standards and Engineering Information": General standard definitions and nomenclature, types of receivers, receiver controls, receiver characteristics, power ratings, antenna installation, screws, dial lamps, tube sockets, inductors, transformers, on-off switches, vacuum-tube-base dimensions, terminal cap dimensions, base connections, and items relating to television. One of the most useful standards adopted and published by this association within the past year is the one covering color coding of small resistors. A new section has been added to the association's publication of standards known as Proposed Standardization. In this section will appear material which has been proposed for standardization, but which has not been approved by the standards committees. The association is officially represented on the ASA sectional committee on radio.

Rag Content Paper Manufacturers, E. H. Naylor, 95 State Street, Springfield, Mass. Through the efforts of the members of this organization, there has

been established a minimum standard with respect to the percentage of rag content in papers. The standard provides that papers having less than 25 per cent rag content shall not be watermarked, labeled, advertised, or sold as rag content papers.

Rail Steel Bar Association, H. P. Bigler, secretary, 228 North La Salle Street, Chicago, Ill. For approximately two years the member mills of this association have followed a certification plan by which deformed rail steel reinforcing bars are marked with a permanently rolled symbol. This symbol is evidence of manufacture by a member of the association and designates the material as rail steel rolled in accordance with the general standards of the industry and meeting the requirements of the association for quality. The symbol further indicates a willingness to certify to this quality. As now operating, certification is made on a basis of the requirements of any one of the following standards, all of which are in substantial agreement: American Society for Testing Materials specification A16-14 for rail steel concrete reinforcement bars; No. 350a (QQ-B-71) of the Federal Specifications Board, specifications for rail steel concrete reinforcement bars of the Association of American Steel Manufacturers, and specification G31-1930 of the Canadian Engineering Standards Association on the same subject. Policing of quality is performed by general tests by the association's committee on metallurgy and by routine tests by the individual mill's inspection departments, as well as by routine inspection customarily required by the consumer. The committee on metallurgy conducts tests on the product of each member mill to determine the general average of quality for the industry and the variations of each mill from this average. The association has engaged in or has been sponsor for several co-operative research projects with other technical groups. These include the American Concrete Institute concrete column investigation, and an extensive study of the use of rail steel for highway construction by the National Research Council. Plans are now being completed for the establishment of an investigation of the reinforcing value of high elastic limit steel by the National Research Council.

Railway Fire Protection Association, R. R. Hackett, secretary, care of Baltimore & Ohio Railroad, Baltimore, Md. This association cooperated with several organizations in the formulation of standards on lacquers and finishes,



highway coaches and trucks, fire hose, and fire-fighting equipment in metal mines. It also cooperated with the National Fire Protection Association in the establishment of rules and regulations dealing with automatic sprinklers, gases, protection of openings in walls and partitions, storage of tanks, dust explosion in grain elevators, and other subjects. The association has revised its handbook of recommended standards and suggestions to include recommendations regarding the construction and fire-hazard prevention of grain elevators and storehouses, and the safe storage of records. Committees of the association are continuing their studies in developing standards and recommendations for fuel oils, incinerators, freight-car heaters and refrigerator cars, bridges and trestles, air compressors, fire-alarm signaling systems, gas systems for welding and cutting, natural gas and gasoline pipe lines on railroad property, etc.

Red Cedar Shingle Bureau, Arthur Bevan, secretary-manager, Stuart Building, Seattle, Wash. In cooperation with the Bureau of Standards and various units of the industry, this organization established the commercial standard relating to quality standard for western red cedar shingles. This bureau has also adopted new grading and packing rules which represent a considerable reduction in the number of grades heretofore in use. The bureau issues a label for the use of mills licensed by it, which certifies that the shingles to which the label is attached are in accordance with the commercial standard. Only those mills which sign contracts to restrict their output to products which meet the new standards and which agree to have their product inspected are allowed to use the label. The product of member mills is subjected to inspection by inspectors under the direct control of the bureau and failure to comply with the standard means withdrawal of the label until required improvements are made.

Refrigerating Machinery Association, Fred Nolde, secretary, 23 South Fifty-second Street, Philadelphia, Pa. This association is cooperating with the joint commercial refrigeration committee and commercial refrigerator manufacturers in standardizing construction details for commercial refrigeration installation; and with the joint research committee on welded pressure vessels in the revision of the ASME code for unfired pressure vessels. It is also cooperating with the committee on heat transmission for

the development of an insulation test code. The standard specifications for ammonia valves, flanges, and fittings, formulated and adopted by this association, have been submitted to the American Standards Association for further consideration.

Rubber Manufacturers Association, (Inc.), A. L. Viles, general manager, 250 West Fifty-seventh Street, New York, N. Y. During the past year the tire manufacturers division of this association cooperated with the Tire and Rim Association in the development of standard combination of tire tube sizes. The mechanical rubber goods specification committee prepared and adopted standard specifications for wrapped and braided water hose. This committee is now engaged in the preparation of standard specifications for transmission belts. Through several other committees, the association cooperated with the industry in the establishment of commercial standards for cotton cloth for rubber and pyroxylin coating, rubber sheeting, surgeons' rubber gloves, and surgeons' latex gloves. The association is continuing its work relative to the development of model specifications for various types of conveyors and elevator belting for the purpose of eliminating the existing diversity in customers' specifications.

Sand-Lime Brick Association, Ellen Knight, secretary, 321 North Hamilton Street, Saginaw, Mich. This association adopted the ASTM specification for sand-lime brick. It cooperated with the Federal Specifications Board in the formulation of the Federal specification for common sand-lime brick. It is officially represented on the simplified-practice committee which is carrying on work in the standardization of masonry openings.

Scientific Apparatus Makers of America, J. M. Roberts, secretary, 100 North La Salle Street, Chicago, Ill. During the past year this organization has been actively cooperating with the American Chemical Society, the Bureau of Standards, and the American Society for Testing Materials in standardizing laboratory apparatus.

Shovel and Crane Manufacturers Association, G. H. Olson, secretary, care of Link-Belt Co., 300 West Pershing Road, Chicago, Ill. This association developed a set of standards applying to crawler tread mounted excavating machines (shovels, draglines, cranes, and the several combinations thereof), which became effective on October 1, 1932. Included in these standards is a guarantee clause which states that

members of this association shall attach to their machines, in a conspicuous place inside the cab, a guarantee plate reading: "This machine with its rating is guaranteed by the manufacturer to conform to the standards adopted by the Shovel and Crane Manufacturers Association and in effect at the time of manufacture. These standards are a matter of record and are on file with the ASME." This association is now cooperating with the American Society of Mechanical Engineers in developing standards covering standard-gage track cranes, and a safety code covering this class of equipment.

Silk Association of America (Inc.), Ramsay Peugnet, secretary, 468 Fourth Avenue, New York, N. Y. Standards for the examination of finished broad silks, and a revised form of contract to cover transactions in the purchase and sale of raw goods were adopted by this association during the past year. Raw-silk rules are in the process of revision by a committee of buyers and sellers. A uniform system of count for spun rayon yarn has been recommended to the trade as a result of steps taken by spun rayon manufacturers to standardize their yarn count. This has been done under the auspices of the association. The Joint Committee on Raw Silk Classification is continuing its study of standards of evenness and neatness of raw silk, and has selected a group of proposed standards which modify present standards, and also increase the accuracy of estimating. The methods of standardization which were proposed in the progress report issued by the Raw Silk Classification Committee last year are now being studied in laboratories throughout the trade to determine their accuracy and their relation to present standards. This committee is also considering further modifications which will bring the proposed classification nearer in harmony with the Japanese classification.

Society of Automotive Engineers (Inc.), John A. C. Warner, secretary and general manager, 29 West Thirty-ninth Street, New York, N. Y. Approved standards of the society are published in its handbook, which is revised and published in February of each year. Standards adopted semi-annually each year are published in a supplement to the handbook and incorporated in the next edition. In the present edition there are more than 600 specifications. During the past year, 37 new and revised specifications were adopted. Among the new speci-

fications adopted are airplane-engine carburetor mountings; probability curves of physical properties of heat-treated steels; mountings for oil filters on gasoline engines; piston rings and grooves for gasoline engines of 2 to 8 inch diameter cylinders; aluminum and zinc alloy specifications for die castings; and a trial classification of lubricants for automobile free-wheeling units. Progress is being made in formulating other standards, including a method of rating motor trucks, toward the promulgation of uniform technical requirements in the regulation of motor vehicles by the States, and developing approved specifications for insulated and for high-tension ignition cable. New or revised specifications are being developed in practically all automotive fields. These projects include engine valve-seat rings; aircraft steels; carbon and alloy steels and their physical property charts; outboard motor standards; aluminum, brass, and copper alloys; spline fittings; automobile body parts; screw threads; and screws, bolts and nuts. For automotive type Diesel engines, standardization of engine nomenclature and parts, such as fuel nozzle connections, connecting-rod bolts, and shaft couplings, is in progress. A limited amount of advertising in the society's handbook is restricted to the suppliers of automotive parts or materials conforming to the society's specifications. The 1931 handbook, which is supplemented by the 1932 edition of specifications adopted during 1931, also listed nearly 800 companies that certified that their products conform with SAE specifications. The classification of lubricating oils by SAE viscosity numbers instead of the old systems, such as light, medium, and heavy oils, lists nearly 150 oil companies as marketing their products under the SAE numbers. The numbers have also been adopted by many of the automobile vehicle manufacturers in their instructions to vehicle purchasers. Together with the American Petroleum Institute and the National Automobile Chamber of Commerce, the society maintains research associates at the Bureau of Standards investigating the mutual adaptation of fuels and motor vehicle engines. The society acts in an advisory capacity on the co-operative committee on motor-truck impact tests. Under the auspices of this committee, the United States Bureau of Public Roads has been conducting the impact tests. The Bureau of Standards has assisted on



instrumentation problems. During the past year the Bureau of Standards has undertaken a research program on extreme pressure lubricants under the auspices of the society with funds provided by interested companies in the automotive and petroleum industries. The society is sponsor or joint sponsor for 11 sectional committees working under American Standards Association procedure, dealing with the following projects: Aeronautic safety code; antifriction bearings; classification and designation of surface qualities; bolt, nut, and rivet proportions; motor-vehicle lighting specifications; machine pins; plain and lock washers; screw threads; small tools and machine tool elements; transmission chains and sprockets; and wire and sheet-metal gaging systems.

Society for Electrical Development (Inc.), K. A. McIntyre, managing director; J. Smieton, jr., secretary-treasurer, 420 Lexington Avenue, New York, N. Y. This society has formulated and offers the "Franklin specifications" as uniform standards for determining outlet spacing, lamp size, and mounting height for general lighting installations in commercial, industrial, and public building interiors. During the past year a joint industry conference composed of representatives of eight national electrical associations, including the society, developed and adopted "Adequacy Wiring Standards for Residence Buildings." The society is continuing its Red Seal Plan for identifying a house that is properly and adequately wired in accordance with the approved "Red Seal Minimum Specifications." The plan involves wiring specifications, and inspection, and an award. Inspection is provided locally by a representative of a duly authorized operating organization who checks the specifications against the job. If the wiring installation conforms to the specifications, an award is made consisting of a miniature red seal, permanently affixed to some part of the main service panel, and a certificate signed by officers of the operating organization is issued to the house.

Society of Industrial Engineers, George C. Dent, executive secretary, 205 West Wacker Drive, Chicago, Ill. This organization is officially represented on two sectional committees of the American Standards Association on safety code for conveyors and conveying machinery and on tables of preferred numbers. Within its own organization it is engaged in the development of

production standards, plant maintenance standards, and standardization of management terminology.

Society of Motion Picture Engineers, M. C. Batsel, chairman of standards committee, 33 West Forty-second Street, New York, N. Y. The standards committee of this society is now revising the dimensional standards and recommended practices for motion-picture apparatus developed previously by the society under the rules of procedure of the American Standards Association. One of the projects now before the committee includes a revision of the standard layout of 35-mm sound film to make it conform to the recently adopted revision of projector and camera aperture dimensions. The standards committee is also working on the standardization of 16 mm sound film and equipment.

Society of Terminal Engineers, Charles H. Newman, secretary, 114 Liberty Street, New York, N. Y. In cooperation with the American Society of Mechanical Engineers, this organization has appointed a committee for the purpose of making studies relative to the establishment of a standard dealing with height of loading platforms at freight terminals and warehouses. The society is continuing its research on the properties and life of wire rope in collaboration with the ASME. It is officially represented on three ASA sectional committees on safety codes for elevators and escalators; conveyors and conveying machinery; and cranes, derricks, and hoists.

Southern Cypress Manufacturers Association, T. M. True, secretary, Barnett National Bank Building, Jacksonville, Fla. This association has adopted standard grades and classifications of cypress lumber. During the past year it also formulated and adopted standard grades and classifications of tidewater red cypress structural material which are in conformity with American lumber standards grading rules promulgated by the Department of Commerce. The association permits its members to stamp their product with the association trademark provided the lumber conforms to the grading rules of the association.

Southern Pine Association, H. C. Berckes, secretary-manager, New Orleans, La. This association has adopted and publishes grading rules for southern pine lumber (both long-leaf and short-leaf) under three classifications: The Gulf coast classification of pitch pine sawn timber and resawn lumber for use in export; car material

specifications for southern yellow pine, for use of railroads and car builders; standard specifications for grades of yard lumber and long-leaf and short-leaf southern yellow pine structural timbers, joist, and plank. The car material grading rules for 1932 and the standard specifications for yard stock and structural timbers, joist, and plank conform to American lumber standards. The most recent revision of the standard yard and the timber rules is March, 1932, published and effective September 1, 1932. The grading rules are enforced at the mills by regular monthly inspections made by inspectors of the association at the mills of the subscriber companies. In addition, a corps of official inspectors is maintained in the consuming territory for investigating complaints of buyers who may believe they have not received the grades which they purchased. Subscribers of the association may place the official grade mark on all the lumber they produce; non-subscribers who are manufacturers of either or both species of southern yellow pine may have their lumber officially grade marked if they will submit it to the inspection of the association.

Southern Supply and Machinery Distributors' Association, Alvin M. Smith, secretary-treasurer, care of Smith-Courtney Co., Richmond, Va. Although this organization has not initiated any standards or specifications, it has cooperated with manufacturers in working out their standardization programs. This association cooperated with the Bureau of Standards and the industry in the preparation of simplified practice recommendations relating to standard sizes of hacksaw blades; standard sizes of wrought-iron and wrought-steel pipe, valves, and fittings; and standard packing of carriage, machine, and lag bolts.

Sporting Arms and Ammunition Manufacturers Institute, C. Stewart Comeaux, secretary, 103 Park Avenue, New York, N. Y. The committee on simplified practice of this institute cooperated with the Bureau of Standards and the industry in the establishment of the simplified practice recommendation which brought about a reduction in the number of loads of paper shot shells from more than 4,000 to less than 350 during the past eight years. Subcommittees appointed by the institute are engaged in work on the following projects: Standardization of chamber dimensions and of cartridge sizes used therein, standard barrels for pressure gages, and proofing methods of small

arms to be recommended as standard American practice.

Steel Founders' Society of America (Inc.), Granville P. Rogers, managing director, 420 Lexington Avenue, New York, N. Y. This association published a booklet containing the standard trade customs adopted by the society to be used by buyers and producers of steel castings. In addition, it adopted standard sales contract and order acceptance and quotation sheet for the purpose of simplifying transactions between steel foundries and their customers. The society cooperates with the American Society for Testing Materials and the American Foundrymen's Association in the formulation of steel castings specifications. It conducted tests to assist in the revision of the national safety code pertaining to use and care of abrasive wheels and is represented on the sectional committee of American Standards Association which recently revised the standard safety code for the protection of workers in foundries.

Steel Joist Institute, Frank Burton, consulting engineer, 1732 Dime Bank Building, Detroit, Mich. This organization sponsored the movement for the establishment of standard sizes of open web steel joists which resulted in the formulation of the simplified practice recommendation promulgated by the United States Department of Commerce.

Structural Clay Tile Association, Joseph J. Cermak, secretary, 205 West Wacker Drive, Chicago, Ill. This association has issued a publication entitled "Specifications for Structural Clay Building Tile," recommended for standard approved building code and engineering practice. The association has set up a quality label service by which the manufacturer certifies that the material to which the label is attached is in conformity with the specifications of the American Society for Testing Materials and the standards of the Structural Clay Tile Association.

Tanners' Council of America, J. L. Nelson, secretary, 41 Park Row, New York, N. Y. Working in cooperation with the Bureau of Standards and the industry, the bag, case, and strap leather group of this council established the commercial standard relating to standard thicknesses of bag, case, and strap leather which has been adopted by both the council and the industry. The council has also adopted standard grades and specifications for upholstery leather.



Tap and Die Institute, now a division of the Metal Cutting Tool Institute. (See p. 205.)

**Telephone Group.** This group which functions under the auspices of the American Standards Association consists of representatives of the Bell Telephone System and the United States Independent Telephone Association. The secretary of the group is H. L. Huber, of the American Telephone & Telegraph Co., 195 Broadway, New York, N. Y. This group took an active part in the formulation of the following standards approved by the ASA: Specifications for soft annealed copper wire, specifications for tinned or soft annealed copper wire for rubber insulation, specifications for hard-drawn copper wire, fiber stresses of wood poles, manufacturing standards applying to broadcast receivers, standard vacuum tube base and socket dimensions, and the National Electrical Code. Through representatives on various ASA sectional committees it is assisting in the preparation of 18 additional standards. The group cooperates with numerous committees of the telegraph and telephone section of the American Railway Association in the formulation of recommendations and specifications dealing with various phases of railway communication. It is sponsor or joint sponsor for two sectional committees of the American Standards Association, as follows: Manhole frames and covers, and specifications for wood poles.

**Textile Converters' Association,** Samuel M. Fisher, secretary, 291 Broadway, New York, N. Y. This association has adopted a standard method to be employed by the finishers of cotton fabrics for the return by finishers to the converter of all stretched as well as damaged goods and remnants of finished merchandise over one yard in length. It has also adopted standard definitions of fair trade practices in the sale and purchase of cotton gray goods for the converting trade. In addition, during the past year, the association formulated and adopted uniform sales note clauses for inclusion in contracts covering gray goods and several standard "good trade" practices for the guidance of converters in the corset and brassière trade.

**Tire and Rim Association (Inc.),** C. E. Bonnett, general manager, 1401 Guarantee Title Building, Cleveland, Ohio. This association formulates and maintains standards on tires, rims, and wheels for automotive vehicles. It works in close conjunction with the Rubber Manufacturers Association and

the Society of Automotive Engineers, and changes in, or additions to, the standards are reviewed by these organizations before they are published as final. The association publishes a yearbook which is revised and brought up to date annually and which contains a complete list of its standards covering equipment for passenger cars, trucks and busses (both pneumatic and solid), motor cycles and airplanes. During the past year this association published a supplement to the yearbook in which are included experimental standards on low-pressure balloon tires and rims. The association incorporates in its membership insignia three trade-marks which are used to indicate rims manufactured in accordance with the standards of the association and approved by their inspectors. One brand identifies rims not transversely split, a second appears on all rims into which wire wheels are laced, all disk wheels with non-demountable rims, and all rims with two or more transverse splits. The third is used on all transversely split rims approved by the association.

**Tissue Paper Manufacturers Association,** Herbert Thwaite, general manager, 270 Madison Avenue, New York, N. Y. Members of this association are using the official label and seal on cartons of toilet rolls, guaranteeing the package to be in accordance with the simplified-practice recommendation for this item established by this industry under the auspices of the Bureau of Standards. The label is also a guaranty that the paper contained in the carton is made entirely of new pulp.

**Underwriters' Laboratories,** Dana Pierce, president, 207 East Ohio Street, Chicago, Ill. This organization is established and maintained by the National Board of Fire Underwriters to conduct tests on appliances, devices, machines, and materials for their merits respecting life, fire, and collision hazards, and theft and accident prevention. Reports on these tests are issued to insurance organizations, city, State, and Government offices. It formulates standards covering the materials, design, strength, and operating features of appliances and devices and uses these standards as bases for the inspection of appliances and the preparation of lists of devices complying with the laboratories' standards. Two methods of supervision are used for listed devices. In one, examinations and tests of the appliances are made one or more times yearly and features found not complying with the laboratories' require-

ments are corrected by the manufacturer or the product is removed from the list. As long as listing continues the manufacturer is permitted to apply a marker indicating that it is listed under reexamination service. In the other method of supervision, devices and materials are inspected by Underwriters' Laboratories' inspectors at the factories, and goods complying with laboratories' standards are labeled by stamps, transfers, or labels, so that they may be recognized wherever found. This method of identification has been used since 1906. Standards issued or revised during the past year include: Attachment plugs and receptacles, flexible steel conduit, industrial control equipment, Edison base lamp holders, transformers, rubber-covered wires and cables, cotton rubber-lined fire hose, soda acid fire extinguishers, bandit-resisting inclosures, minimum burglary resistance of safes and cabinets, central office burglar alarm systems, manually operated gas systems for protection against robbery, hold-up alarm systems, oil burners, range burners, and inside tanks for oil burners. This organization is acting as sponsor under American Standards Association procedure for the preparation of specifications and standards for electrical and other devices and materials with relation to fire and casualty hazards.

United Roofing Contractors Association of North America, E. M. Pope, secretary, 58 West Washington Street, Chicago, Ill. Standards and specifications covering roofing materials have been developed by this association. It has issued specifications covering the weights of materials, construction and installation requirements, and also a standard practice of providing in the construction of insulating roofs a mopped felt seal course of tarred or asphalted felt at intervals of not more than 30 feet in each direction. This association permits manufacturers to use its trade-mark label on materials inspected and found to comply with its specifications.

United States Golf Association, Herbert Jacques, chairman of the implements and ball committee, P. O. Box 30, Lowell, Mass. Although this association does not carry on standardization work as such, its implements and ball committee does concern itself with weight and size specifications of golf balls and also as to the form and make of golf clubs.

United States Hemp Brokers Association, H. E. Higginbotham, secretary, 90

Wall Street, New York, N. Y. This association maintains a committee of three independent brokers who examine samples of manila rope manufactured in accordance with the Federal specification covering this commodity. A certificate of grading is issued by the association to purchasers whose samples have been submitted for inspection stating whether in the opinion of the committee the samples comply with the specification requirements as to fiber contents and contain the necessary percentage of grades called for in the specification, with information in cases of noncompliance as to the cause of failure.

United States Pharmacopœial Convention, Walter A. Bastedo, president, 33 East Sixty-eighth Street, New York, N. Y.; E. Fullerton Cook, chairman, Committee on Revision of the Pharmacopœia of the United States of America, Forty-third Street and Woodland Avenue, Philadelphia, Pa. This organization prepares and publishes the Pharmacopœia of the United States, the object of this publication being to provide standards of purity and strength for the drugs and medicines of therapeutic usefulness or pharmaceutical necessity sufficiently used in medical practice to receive recognition by the medical profession. The Pharmacopœia is revised every 10 years, the last revision taking effect on January 1, 1926. In 1930 a new Committee on Revision was appointed and work has been proceeding since then in preparation for the eleventh revision of the Pharmacopœia.

United States Shellac Importers Association (Inc.), L. W. Babbage, secretary, 17 State Street, New York, N. Y. Establishment of official methods of analysis for the determination of rosin, wax, moisture, and arsenic in shellac have been approved and adopted by both this association and the American Bleached Shellac Manufacturers Association. During the past year it revised its set of standard rules and regulations for the sampling of shellac. This association has put into effect a plan for the sampling of all shipments of shellac imported into the United States. It provides for a standardization bureau under which functions an examination committee whose duty it is to examine samples of the various grades of shellac and to pass upon their quality in accordance with the official rules and regulations of the association. Copies of certificates are issued by the committee to both buyer and seller and a copy is also filed with the



association. This organization maintains a research bureau at Polytechnic Institute of Brooklyn.

Wall Paper Association of the United States, A. Louise Fillebrown, executive secretary, 10 East Fortieth Street, New York, N. Y. This association cooperated with the Bureau of Standards in the establishment of the commercial standard relating to grades and quality of wall paper. It has copyrighted a self-identifying trade-mark guaranteeing wall paper manufactured by its members to be in accordance with the requirements set forth in the commercial standard relating to this commodity.

Waste Paper Institute, Charles M. Haskins, secretary, Times Building, New York, N. Y. This organization is affiliated with the National Association of Waste Material Dealers. During the past year the institute cooperated with the Paperboard Industries Association in the formulation of standard specifications for waste paper covering grades, descriptions, and minimum and maximum weights per bale.

West Coast Lumbermen's Association, W. B. Greeley, secretary, 364 Stuart Building, Seattle, Wash. This association cooperated in the lumber standardization movement which resulted in the formulation of American lumber standards published by the United States Department of Commerce. It has issued publications relating to standard grading and dressing rules for Douglas fir, sitka spruce, west coast hemlock, and western red cedar lumber; standard grades for architectural woodwork, standard wood moldings (7,000 series revised in 1931) published by the National Lumber Manufacturers Association; specifying grade-marked lumber; shippers certificate of car contents; etc. The association maintains a grading and inspection department which makes periodic checks and supervises the grades manufactured by its members. It maintains lumber inspectors in the consuming territory who reinspect lumber upon complaint and, upon request, issue certificates of inspection indicating quality and quantity of lumber shipped. They also grade mark, inspect, and reinspect lumber for non-members of the association. The supervisory service is available to members only who may grade mark their lumber in accordance with association rules. The association licenses wholesale and retail distributing yards located in southern California authoriz-

ing the use of its registered association grade mark.

Western Pine Association, David T. Mason, manager, S. V. Fullaway, jr., secretary, Yeon Building, Portland, Oreg. Standard grading rules for ponderosa pine, sugar pine, Idaho white pine, larch, white fir, Douglas fir, Engelmann spruce, incense cedar, and western red cedar lumber have been adopted by this association which has succeeded the former Western Pine Manufacturers Association and the California White and Sugar Pine Manufacturers Association. These rules conform generally to American lumber standards grading rules formulated by the Central Committee on Lumber Standards. It has also adopted standard grading rules for larch and Douglas fir railroad-car material, and standard specifications and working stresses for structural grades of larch and Douglas fir joists, planks, posts, and timbers. The association is encouraging the grade and trade marking of lumber to conform to association standards, and the use of car cards certifying the grade of lumber in car shipments. It maintains a lumber-inspection system for the purpose of checking the grades of lumber produced by its various member mills, and in addition offers its inspection facilities for the reinspection of shipments in dispute.

Western Red Cedar Association, consolidated with Northern White Cedar Association. (See p. 221.)

Wire Cloth Manufacturers' Association, A. M. Ferry, secretary, Chandler Building, Washington, D. C. This organization cooperated with the Bureau of Standards in the establishment of the commercial standard for Fourdrier wire cloth which includes the standard meshes adopted, dimensions of wire and details of weave, packing, storage, care of wire cloth, etc.

Wire Screen Cloth Manufacturers' Institute, George E. Watson, secretary, 74 Trinity Place, New York, N. Y. In cooperation with the Bureau of Standards and other units of the industry, this organization sponsored the movement for a simplification of stock varieties of wire insect screen cloth which resulted in the formulation of the simplified practice recommendation relating to this commodity. The institute has adopted a label to be placed on all screen cloth made by its members indicating that the roll in question is guaranteed to comply with the requirements set forth in Simplified Practice Recommendation R122-31.

World Calendar Association (Inc.), Elizabeth Achelis, president, 485 Madison Avenue, New York, N. Y. This association was organized for the purpose of advocating a revision of the present 12-month calendar in order to meet modern requirements. Under the plan being advanced by this association, the year will be divided into four equal quarters, each consisting of three months, the first of which will have 31 days and the remaining two months 30 days each. Each month has 26 week days. The odd three hundred and sixty-fifth day of the year, Year-day, is considered as an extra Saturday between December 30 and

January 1. The three hundred and sixty-sixth day in Leap Years, Leap-Day, is considered as another extra Saturday between June 30 and July 1. January 1, New Year's Day, always falls on Sunday, and the working week begins the following day.

Writing Paper Manufacturers Association, E. H. Naylor, secretary, 95 State Street, Springfield, Mass. This organization has adopted the standard stock sizes of bonds, ledgers, and writing paper given in the simplified practice recommendation issued by the Bureau of Standards. These are now set forth in a pamphlet issued by this association entitled "trade customs."



## X. BIBLIOGRAPHY ON STANDARDIZATION <sup>1</sup>

Supplementary to the lists printed in the Standards Yearbook, 1928, 1929, 1930, and 1931, and to Bureau of Standards Miscellaneous Publication No. 136

[Compiled by Anne L. Baden, division of bibliography, Library of Congress, under the direction of Florence S. Hellman, acting chief bibliographer. The call numbers accompanying the entries are those of the Library of Congress.]

The following bibliography comprises references to the general literature. Care has been taken to omit citations to the more specialized literature on standardization of specific commodities.

Agnew, Paul G.:

Association and company standardization movements. Fundamental principles essential to success of these activities. U. S. Bureau of standards. Commercial standards monthly, Nov., 1931, v. 8: 143-144. HD62.U3, v. 8. Recommends standardization of household implements; speech to American home economics association. New York Times, June 28, 1931, pt. 2, p. 2, col. 4.

Agnew, Paul G., and J. W. McNair:

Certification and labeling activities in 60 commodity fields. American standards association. Bulletin, Jan., 1932, v. 3: 1-24.

Akerman, Gustav:

Om den industriella rationaliseringen och dess verkningar, särskilt beträffande arbetsrysselsättningen. Stockholm, P. A. Norstedt & söner, 1931. 180 p.

Albrecht, G.:

Rationalisierung. (In Wörterbuch der Volkswirtschaften. 4 Aufl. Jena, Fischer, 1932, v. 2, p. 1193-1201.)

Alenius, N. R.:

Den tekniska rationaliseringen och raentabiliteten. Tekniska foereningens i Finland foerhandlingar, Feb. 1931, v. 51: 31-37.  
Deals with the profits of industrial rationalization.

Alexander, J. Don. Reducing costs of operation. Standardized method of operation eliminates unnecessary costs. U. S. Bureau of standards. Commercial standards monthly, Nov., 1931, v. 8: 156-157. HD62.U3, v. 8.

American society for testing materials:

Index to American society for testing materials standards and tentative standards, 1931. Philadelphia, American society for testing materials, 1931. 103 p.

This combined index, which covers all standards of the association in effect in September, 1931, and tells in which publication they may be found, makes it easy to determine whether a specification exists on any particular subject.

Index to proceedings, volumes 26-30 (1926-1930). Philadelphia, American society for testing materials, 1932. 251 p. TA401.A5.

"Standardization" : p. 144-145.

1931 supplement to book of American society for testing materials standards. Philadelphia, American society for testing materials, 1931. 144 p.

This supplement brings up to date the 1930 book of standards published by the association. It contains 32 standards, 17 of which are new and 15 replacements of former ones.

Proceedings, 1931. Philadelphia, American society for testing materials, 1931. 2 v. TA401.A5. 1931.

The first volume contains new and revised tentative standards and tentative revisions of present standards for testing various materials.

<sup>1</sup>71 entries have been omitted by the editors of the yearbook, owing to limitation of the size of the volume.

**American society for testing materials—Continued.**

Selected A. S. T. M. standards for students in chemistry, chemical engineering and metallurgy. 1931. Philadelphia, Pa., American society for testing materials, 1931. 184 p. TA401.A655.

Includes bibliographies.

Deals with standard tests and specifications for metallic and nonmetallic materials.

Selected A. S. T. M. standards for students in engineering. 1931. Philadelphia, Pa., American society for testing materials, 1931. 172 p. TA401.A656.

Deals with standards and specifications for metallic and nonmetallic materials, ferrous metals, and nonferrous metals.

Tentative standards, 1931 edition. Philadelphia, American society for testing materials, 1931. 1008 p. TA401.A65 1931.

It contains 180 specifications of various materials.

American standards association, Bulletin. Beginning with July, 1932 issue, the title of the Bulletin will be changed to Industrial standardization.

Androuin, M. L'état actuel de la normalisation industrielle. Arts et metiers, Apr., 1931, no. 127: 114-117.

Also in Société des ingénieurs civils de France. Bulletin, May, 1931 v. 84: 682-697. TA2.S4, v. 84.

Deals with the rapid progress of standardization in all civilized countries, with special reference to France.

Angus-Butterworth, L. M. Rationalisation. Iron and steel industry, June, 1931, v. 4: 305-308, 316.

Treats of the origin of rationalization, definitions, changes due to war, regulation of production, standardization, etc.

Aronson, Jacob P. Legal aspects of standardization. Legal issues involved in buying and selling under statutory standards reviewed. U. S. Bureau of standards. Commercial standards monthly, Dec., 1931, v. 8: 184-185. HD62.U3, v. 8.

Association française de normalisation. A propos d'une récente publication, Courrier de normalisation, de l'Association française de normalisation: organisation de la normalisation nationale et internationale. Revue générale de l'électricité, Jan. 30, 1932, v. 31: 137-138. TK2.R35, v. 31.

The Austrian Kuratorium für Wirtschaftlichkeit. International management institute. Bulletin, June, 1932, v. 6: 87-88. T58.A21852, v. 6.

Deals with its activities in the Austrian rationalization movement since its establishment in 1928.

Barley, L. J. The riddle of rationalisation. London, George Allen & Unwin, Ltd., 1932. 148 p.

Base control on standards—theme of Taylor society meeting. Factory and industrial management, Jan., 1932, v. 83: 4-5. TA1.E59, v. 83.

Argues that planning and control must be based on standards.

Bassett, H. N. The value of specifications in control of supplies. Society of chemical industry. Journal (Chem. & ind.), Sept. 18, 1931, v. 50: 772-774. TP1.S6, v. 50.

Beckenkamp, C. Bedrijfsorganisatie van antirevolutionnair standpunt beschouwd. Kampen. Kok, 1932. 184 p.

Beer, H. W. Says standardization destroys effect of anti-trust laws. New York Times, Mar. 20, 1932, pt. 2, p. 19, col. 6.

Bombay (Presidency). Labour office. The social aspects of rationalisation. Its Labour gazette, Jan., 1932, v. 11: 483-491. HD8682.B6, v. 11.

Brady, Robert A. The meaning of rationalization: An analysis of the literature. Quarterly journal of economics, May, 1932, v. 46: 526-540. HB1.Q3, v. 46.

Footnote references are given.

Bremner, D. A. British engineering standards and foreign markets. Engineer (London), June 3, 1932, v. 153: 619-620. TA1.E5, v. 153.



- Briefs, Goetz. Arbeitslosigkeit und Rationalisierung. Wege zur Arbeit, Apr. 22, 1932, v. 1:14-16.
- "British standard." Electrical review (London), Jan. 22, 1932, v. 110:114. TK1.E44, v. 110.  
Deals with British specifications.
- Brunner, J., and others. The economic significance of specifications for materials. (In American society for testing materials. Proceedings, 1931. Philadelphia, 1931, pt. 2, p. 955-995.) TA401.A5. 1931. Same Western society of engineers. Journal, Oct., 1931, v. 36:280-301. TA1.W52, v. 36.
- Budnevich, Dan G.:  
Soviet industries now standardized. Save hundreds of millions by adopting American methods. Journal of commerce, July 1, 1931, p. 5.  
Standardization aids Russia's program of industrialism. Steel, Sept. 3, 1931, v. 89:33-34. TS300.I745, v. 89.
- Burgess, George K. Past year an active one for Bureau of Standards. Annual report of Bureau of Standards describes many notable achievements in science and technology. U. S. Bureau of standards. Commercial standards monthly, Nov., 1931, v. 8:157-158. HD62.U3, v. 8.
- Butler, Harold B.:  
Unemployment problems in the United States. Geneva, 1931. 112 p. ([International labor office, Geneva.] Studies and reports, series c, Employment and unemployment, no. 17.) HD4813.I4. Ser. c, no. 17.  
"Rationalisation in industry"; p. 42-44; "Rationalisation in agriculture"; p. 44-49; "Rationalisation and aggregate earnings"; p. 64-66.
- California State Chamber of Commerce. Simplification program. State group of California has cooperated with Bureau of standards in promoting value of simplification to industry. U. S. Bureau of standards. Commercial standards monthly, Feb., 1932, v. 8:227-228. HD62.U3, v. 8.
- Canadian Engineering Standards Association. Year book, 1930. Ottawa [1930]. 52 p. TA368.C28.  
Contents include discussion of the history and activities of the Canadian engineering standards association, world developments in standardization, etc.
- Carlson, Gudron. Norway's standardization report for 1931 issued by Norway's standardization association. U. S. Bureau of standards. Commercial standards monthly, May, 1932, v. 8:342. HD62.U3, v. 8.
- Centralized purchasing at Chicago. Standardization board to be established for setting up standards and preparing specifications to be used by city departments. U. S. Bureau of standards. Commercial standards monthly, Feb., 1932, v. 8:244-245. HD62.U3, v. 8.
- Chapman, Cloyd M. A review of activities of the American standards association during the year 1931. Important new standards, new standardization projects, and other accomplishments surveyed. American standards association, Bulletin, Jan., 1932, v. 3:25-28.
- Clark, Myron H. The development and application of standards to production management. Taylor society. Bulletin, Dec., 1931, v. 16:218-223. T58.A2T3, v. 16.  
Discussion, p. 223-230.  
Also in American standards association. Bulletin, May, 1932, v. 3:141-146.  
Abstract in Iron age, Dec. 10, 1931, v. 128:1496. T1.17, v. 128.
- Comité de normalisation de la mécanique. Les travaux. Session de janvier, 1931. Société d'encouragement pour l'industrie nationale. Bulletin, Apr., 1931, v. 130:211-212. T2.S6, v. 130.  
Report of session and proposed standards.
- Comité de normalisation de la mécanique: mise à l'enquête publique de projets de normalisation. Revue générale de l'électricité, Oct. 3, 1931, v. 30:529; Oct. 17:618; Nov. 7:737-738; Jan. 7, 1932, v. 31:31-33; Feb. 27:265; Mar. 26:401-402; Apr. 23:545-546; May 28:730; June 18:825-826. TK2.R35, v. 30-31.

- Dansk standardiseringsraad. Beretning, 1930-31. Copenhagen, Nielsen and Lydiche, 1931. 47 p.
- Dawson, W. H. The outlook in Germany: The progress of rationalization. Times (London). Imperial and foreign trade and engineering supplement, Aug. 1, 1931, v. 28: 443. HF11.T5, v. 28.
- Définition de la rationalisation. Revue industrielle, Oct., 1931, v. 61: 539-540. T2.R4, v. 61.
- "Deutscher Normenausschusses. Mitteilungen." Published in each issue of the magazine Maschinenbau.
- Dickinson, H. C. Method of drafting federal specifications explained. National petroleum news, v. 23, Apr. 29, 1931: 45. HD9560.1.N3, v. 23.
- Dubravskaya, R.:  
The industrial standardization program of Soviet Russia for the year 1932. American standards association. Bulletin, Jan., 1932, v. 3: 32-33.  
Condensed translation by I. Gutmann of an article in Vestnik standartizatsii. June, 1931, p. 6-8.
- Dubreuil, Henri. Nouveaux standards; les sources de la productivité et de la joie. Paris, B. Grasset [c1931]. 344 p. (Les "Écrits", sous la direction de Jean Guéhenno. [2. sér., 8.] HD8072.D87.  
Standardization: p. 77, 125.
- Economies for industry in simplification. U. S. Bureau of standards. Commercial standards monthly, June, 1932, v. 8: 373. HD62.U3, v. 8.
- Ehrenzweig, Paul. Wie ist eine Lösung der Rationalisierungskrisen möglich? Arbeit und Wirtschaft (Wien), Sept. 1, 1931, v. 9: pp. 671-676.
- Eliasberg, Wladimir. Von der Vernunft bis zur Rationalisierung. Studien zum Rationalismus und zur Berufserziehung; zur Sozialpsychologie, Pädagogik und Psychotherapie der Rationalisierung. Leipzig, Barth, 1932. 96 p. (Schriften zur Psychologie der Berufseignung und Wirtschaftslebens. 42.)
- Ely, Edwin W.:  
Applying simplified practice to machinery. Investigation carried on by Bureau of standards in cooperation with industry. U. S. Bureau of standards. Commercial standards monthly, Apr., 1932, v. 8: 305. HD62.U3, v. 8.
- "Engineering standardization." Published in each issue of the magazine Mechanical engineering. TJ1.A72.
- Englis, Karel. Deflační a racionalizační teorie krise. Obzor národohospodářský, Jan., 1932, v. 37: 1-24.  
Discusses rationalization and the economic crisis.
- Les études du Bureau international du travail sur les effets de la rationalisation dans l'industrie. Génie civil, Jan. 2, 1932, v. 100: 18-19. TA2.G3, v. 100.
- Fédération internationale de normalisation. L'activité. Génie civil, Mar. 12, 1932, v. 100: 272-273. TA2.G3, v. 100.
- Forbes, Russell. Expert on governmental purchasing discusses buying on specifications. American standards association. Bulletin, v. 2, Dec., 1931: 11-15.
- Fürth, Henriette. Um die Rationalisierung. Gewerkschafts-Zeitung, Oct. 31-Nov. 28, 1931, v. 41: 692-693; 710-712; 729-730; 744-745; 761-762.
- Gaillard, John. The value of national standardization to American industry. American standards help to effect savings in manufacturing. Industrial standardization, Sept., 1932, v. 3: 243-246.  
Paper presented before the American society of mechanical engineers, Cincinnati, Ohio, May 12, 1932.
- General survey of the Austrian rationalization organizations at the end of 1931. International management institute. Bulletin, June, 1932, v. 6: 88-89. T58.A2I852, v. 6.  
Gives a list of the organizations.



- Geschelin, J. Standards for maintenance practice would stabilize a big parts market. *Automotive industries*, Jan. 30, 1932, v. 66:150-153. TL1.A6, v. 66.
- Excerpts in Society of Automobile engineers. Journal*, Apr., 1932, v. 30, sup.: 31-32. Discussion, May, 1932:28-30. TL1.S5, v. 30.
- Glahn, H. E. The Danish standards council. Brief outline of the standardization work, as carried out in Denmark, given by Secretary of Dansk standardiseringsraad. U. S. Bureau of standards. *Commercial standards monthly*, Jan., 1932, v. 8: 202. HD62.U3, v. 8.
- Gramenz, K. Stand der internationalen Normungsarbeiten. Vereines deutscher Ingenieure, Berlin. *Zeitschrift*, Oct. 24, 1931, v. 75:1331-1336. TA3.V5, v. 75.
- A review of international coordination of standards on various kinds of machinery, automobile parts, etc.
- Gratama, B. M. The development of international standardisation. *Engineering (London)*, July 1, 1932, v. 134:25-27. TA1.E55, v. 134.
- Gregory, T. The case against rationalisation. *Fortnightly review*, Oct., 1931, v. 136:445-457. AP4.F7, v. 136.
- Argues that so far as Great Britain is concerned, there is no reason to believe that rationalisation, in the sense of large-scale operation, is destined completely to solve the industrial problems.
- Gutmann, I. Short courses in standardization for Soviet Russia. American standards association. *Bulletin*, June, 1932, v. 3:187-188.
- Haan, H. von. Europaeische Aspekte der Rationalisierungsbewegung. [Geneva?] 1931. 37 p.
- Haines, George H. Advantages and disadvantages of standardization. State purchasing agents review the many advantages that result from standardization as against the disadvantages. U. S. Bureau of standards. *Commercial standards monthly*, Aug., 1932, v. 9:43-44. HD62.U3, v. 9.
- Hansson, Sigfrid. Arbetarna och rationaliseringen. Stockholm, Tidens förlag, 1930. 55 p.
- A study of the problem of rationalization in Sweden with particular reference to the attitude of the trade union movement to this problem. Maintains that the attitude of the Swedish trade unions is definitely favorable.
- Heiberg, Kaare. Norwegian standardization committee has developed 226 standards since it was created in 1923. U. S. Bureau of standards. *Commercial standards monthly*, Mar., 1932, v. 8:277. HD62.U3, v. 8.
- Heineman, Dannie. Rationalisation, mechanisation and unemployment. The crisis—its cause and cure. *Statist.* May 7, 1932, v. 119:728-733. HG11.S8, v. 119.
- Hellmund, R. E. Standardizing sizes and ratings. *Electrical engineering*, Jan., 1932, v. 51:14-19. TK1.A613, v. 51.
- Argues that marked economies may be secured by standardizing industrial products to eliminate all unnecessary sizes and ratings. Based upon a system of preferred numbers, selection of desirable sizes may be made with reasonable accuracy through the use of algebra and geometry supplemented by judgment and common sense.
- Hellmund, R. E., and J. I. Hommel. Standardization by preferred numbers. *American machinist*, Nov. 5, 1931, v. 75:697-700. TJ1.A5, v. 75.
- Deals with preferred numbers recommended by the American standards association.
- Himmer, J. G. Grundfragen der Rationalisierung vom organisch-universalistischen Standpunkte. *Ständisches Leben*, 1931, no. 3:317-354.
- Discusses the technical and commercial phases of rationalization.
- Hische, —. Der Mensch und die Rationalisierung. Bericht über die vom Reichskuratorium für Wirtschaftlichkeit am 27. und 28. Febr., 1931 veranst. Arbeit und Beruf, Aug. 10, 1931, v. 10:231-233. HD8443.A75, v. 10.
- Hollós, József, and István Hollós. A racionalizálás. Budapest, Selbstverlag, 1931. 168 p.

Hubbard, Henry D.:

The romance of measurement. *Scientific monthly*, V. 33, p. 356. Oct., 1931, Q. 1. S817, v. 33.

Describes the importance of measurement in all our undertakings and the constant necessity for developing new measurements.

Testing of materials. To determine value of a material for a given purpose, its properties must be measured. U. S. Bureau of standards. *Commercial standards monthly*, Jan. 1932, v. 8: 199-201. HD62.U3, v. 8.

With reference to specifications or standards of quality.

Hudson, Ray M.:

Government interest in the advancement of standardization. (*In* World power conference. 2d, *Berlin, 1930*. . . Transactions. Berlin, 1931. v. 18, p. 255-275.) TJ5.W6 1930, v. 18.

Historical sketch of the standardization movement in the United States.

Simplified practice, 1921-1931. Industry's need for simplification as important in 1931 as in 1921. U. S. Bureau of standards. *Commercial standards monthly*, Dec., 1931, v. 8: 165. HD62.U3, v. 8.

Huntress, Arthur. The organization of standardization work in the Ingersoll-Rand company; study of successful standardization programs results in elimination of unnecessary variations in products and plant procedure. American standards association. *Bulletin*, v. 2, Oct. 1931: 23-25.

Imperial economic conference, Ottawa, Canada, fosters standardization as a means of economic cooperation. U. S. Bureau of standards. *Commercial standards monthly*, Sept., 1932, v. 9: 71. HD62.U3, v. 9. See also *Industrial standardization*, Sept., 1932, v. 3: 241-242.

Industrial standardization. Published before July, 1932, as the *Bulletin* of the American standards association.

Industry has developed 154 simplified-practice recommendations to date. U. S. Bureau of standards. *Commercial standards monthly*, Feb., 1932, v. 8: 254. HD62.U3, v. 8.

Instituto de organizacao racional do trabalho. Idort. Sao Paulo, Brazil, 1932. Comments on the bulletin are given in the International management institute. *Bulletin*, May, 1932, v. 6: 74 under title "Rationalization in Brazil." T58.A2I852, v. 6.

Institutul romanesc de organizare stiintifica a muncii. Rationalizarea sub diferite aspecte. Conferintele saptamanii rationalizarii 10-17 Noemvrie, 1929. Bucarest, Biblioteca rationalizarii, 1930. 168 p.

Contains a series of lectures given under the auspices of the Rumanian Institute of scientific management dealing with the following questions: Rationalization and social policy by Mr. Raducanu; Trusts and rationalization, by Mr. Michel Manoilescu; Capital and rationalization by Mr. Tasca; Labor and rationalization, by Mr. S. Cunescu.

International labor office, *Geneva*. The social aspects of rationalisation. Introductory studies. Geneva, International labour office; London, P. S. King and son, 1931. vii, 381 p. (Studies and reports, series B, Economic conditions, no. 18.) HD48I3.I4, ser. B, no. 18.

Distributed in the United States by the World Peace Foundation.

International management congress. Program of the International management congress to be held in Amsterdam, Holland, July 18-23, 1932. American machinist, Mar. 10, 1932, v. 76: 352g. TJ1.A5, v. 76.

Includes reference to papers to be read on rationalization and standardization.

International management institute:

*Bulletin*. Geneva, 1931-32. T58.A2I852.

Published in English, French, and German. Contains much material on the subject of standardization in its many aspects.

Rationalization in practice. *Its Bulletin*, June, 1931-Feb., 1932, v. 5: 111-113; 130-134; 154-157; 173-175; 194-195; 212-213; 233-234; v. 6: 8-10; 31-34. T58.T2I852, v. 5-6.

Rationalization's defense. *Mechanical engineering*, Nov., 1931, v. 53: 845-846. TJ1.A72, v. 53.

Deals with a "resolution on rationalization" adopted by the conference of the institute at Geneva, July 4, 1931, concerning the benefits of rationalization in its various aspects.



- Ives, L. T. Simplified production control avoids delays. *Iron age*, Aug. 13, 1931, v. 128: 419-422. T1.I7, v. 128.
- Javits, Benjamin A. Business and the public interest; trade associations, the antitrust laws and industrial planning. New York, The Macmillan co., 1932. HD31.J3.  
Standardization: p. 82, 92, 111-113.
- Johnston, G. A. Social economic planning. *International labour review*, Jan., 1932, v. 25: 58-78. HD4811.I65, v. 25.  
Includes discussion of international standardization.
- Jones, Thomas R. Engineering and shop standardization as a means of reducing overhead. Advantages resulting from different types of company standardization; suggestions for the organization of standardization work. American standards association. *Bulletin*, v. 2, Dec., 1931: 33-37. Discussion: p. 37-39.
- Jouve, G. La rationalisation allemande. *Revue politique et parlementaire*, Apr. 10, 1931, v. 147: 78-89. H3.R4, v. 147.
- Kallós, Arthur. A racionalizálázás határai. *Közgazdasági szemle*, Aug.-Sept., 1931, v. 76: 581-591.
- Karabasz, V. S. Industrial standards. Maintenance of standards in industry just as important for successful management as their establishment. U. S. Bureau of standards. *Commercial standards monthly*, Dec., 1931, v. 8: 163-164. HD62.U3, v. 8.
- Kienzle, Otto. The importance of standardization in periods of depression. A discussion of types of standardization which should be promoted by industrial management during the present period. *Industrial standardization*, Sept., 1932, v. 3: 237-240.  
Translated by John Gaillard from an article in *Werkstättstechnik*, Berlin Germany.
- Kisselyov, V. Controlling figures on standardization for 1931 [Printed in Russian]. *Vestnik standartizatsiyi*, Jan., 1931, no. 1: 1-4.  
A review of the standardization program for 1931 in connection with the 5-year plan.
- Klein, Julius. 120 industries are saving \$250,000,000 yearly by simplification of sizes and other standardization. *New York Times*, May 25, 1931, p. 2, col. 4.
- Krahmer, C. E. Specify for quality. *Architectural record*, Aug., 1932, v. 72, sup.: 22. NA1.A6, v. 72, sup.  
Deals with specifications for various materials.
- Landauer, Edmond. Scientific management from the Paris Congress (1929) to the Amsterdam Congress (1932). By Edmond Landauer, General secretary of the International committee on scientific management. [Geneva, 1932.] 6 p. Mimeographed. Published in German in *Sparwirtschaft*, July, 1932, v. 10: 247-250.  
Deals with the benefits of rationalization.
- Lanzillo, Agostino. La razionalizzazione e il suo "mito." *Rivista bancaria* (Milan), Sept. 15, 1931, v. 12: 721-729.
- Le Chatelier, Henry. Rationalisation et chômage. Paris, Librairie de documentation commerciale et industrielle, 1931. 48 p.  
With reference to rationalization and the economic crisis.
- Legros, L. A. Standardisation. Institution of automobile engineers, *London*. Proceedings, 1930-31, v. 25: 344-365. T1.I.16, v. 25. Also in *Mechanical world*, Mar. 27-Apr. 17, 1931, v. 89: 300-301; 326-328; 366-368. TJ1.M55, v. 89.  
Explains the terms rationalization, simplification, and standardization, and treats of the progress of standardization.
- Lehmann, Max R. Echte Rationalisierung als Zentralproblem positiver Wirtschaftspolitik. Leipzig, Glocckner, 1931. vii, 199 p.
- Le Maistre, C:  
The British standardisation movement and its public significance. (*In* World power conference. 2d, Berlin, 1930. . . Transactions. Berlin, 1931. v. 18, p. 231-241.) TJ5.W6, 1930, v. 18.

Le Maistre, C.—Continued.

The effects of standardization in British industry. The value of standardization as a remedy for some of the present industrial difficulties discussed by director of the British standards institution. U. S. Bureau of standards. Commercial standards monthly, Mar. 1932, v. 8: 273-274. HD62.U3, v. 8.

Empire industrial standards. Canadian engineer, v. 62, May 17, 1932: 42. TA1.C2, v. 62.

Imperial standardisation in industry. Chemical age (London), June 18, 1932, v. 26: 564. TP1.C33, v. 26.

Deals with observations on his Empire tour.

Levy, Hermann. Rationalisierung und Arbeitslosigkeit auf dem Hintergrunde der Weltwirtschaftskrisis. Arbeitgeber, Feb. 1, 1932, v. 22: 59-62.

Lloyd, Bolivar J. Standardizing activities of the Pan American sanitary bureau. U. S. Bureau of standards. Commercial standards monthly, Nov., 1931, v. 8: 155. HD62.U3, v. 8.

Lord, Arthur R. Economic significance of specifications. Engineering and contracting, Jan., 1932, v. 71: 30-32. TA201.E5, v. 70.

McAllister, A. S.:

Benefit of the Bureau of Standards' work to the public. U. S. Bureau of standards. Commercial standards monthly, July, 1932, v. 9: 24. HD62.U3, v. 9.

Simplification methods great aid to business. Washington Post (D. C.), Dec. 31, 1931, p. 9, col. 1-5.

MacGregor, D. H. The adjustment of agriculture to industrial rationalization. Agricultural economics society. Journal of proceedings, Mar., 1932, v. 2: 10-28.

Martin, Percival W. The problem of maintaining purchasing power; a study of industrial depression and recovery. . . . London, P. S. King & son (ltd.), 1931. 314 p. HD61.M3.

Rationalization: p. 238-239, 264.

Martino, Robert A.:

Fostering standardization. Cooperation of the Bureau of standards and the American standards association. U. S. Bureau of standards. Commercial standards monthly, May, 1932, v. 8: 332-334. HD62.U3, v. 8.

How the national Bureau of standards and the American standards association cooperate. American standards association. Bulletin, June, 1932, v. 3: 176-177.

Laws for grading and inspection. Résumé of some legal standards adopted by various states. U. S. Bureau of standards. Commercial standards monthly, Dec., 1931, v. 8: 174-175. HD62.U3, v. 8.

Mason, Edward S. Saint-Simonism and the rationalisation of industry. Quarterly journal of economics, Aug., 1931, v. 45: 640-683. HB1.Q3, v. 45.

Matthes, Carl. Die Rationalisierung der Wirtschaftsprozesse in ihren Auswirkungen auf den in der Wirtschaft tätigen Menschen und seine Erziehung. Zürich, Rascher, 1932. 131 p.

Mauldon, F. R. E. The doctrine of rationalisation. Economic record (Melbourne), Nov., 1931, v. 7: 246-261. HC601.E4, v. 7.

With some comparison between rationalization in Germany and the United States.

Maynard, Harold H., Walter C. Weidel, and Theodore N. Beckman. Principles of marketing. Rev. ed. New York, The Ronald press co. [1932.] 790 p. HF5415.M35 1932.

"Standardization and simplification": p. 486-504. References: p. 504.

Mériel-Bussy, M. Comité de normalisation de la mécanique, assemblée générale annuelle. Revue générale de l'électricité, Jan. 9, 1932, v. 31: 9B-10B. TK2.R35, v. 31.

Meyer, Hans-Erich. Sozialökonomische Anschauungen der freien Gewerkschaften über die Rationalisierung. Erlangen, Höfer & Limmert, 1931. 147 p.



- Mitchell, William N. Production management. Chicago, Ill., The University of Chicago press [1931]. 422 p. (Materials for the study of business.) T. 56.M5.
- "Standardization and simplification of the product" : p. 125-140; "Standards of performance" : p. 185-202. Footnote references are given.
- Moore, Roger D. Brazilian federal purchasing bureau. Technical section of Bureau to determine standards of articles purchased. U. S. Bureau of standards. Commercial standards monthly, Feb., 1932, v. 8: 247. HD62.U3, v. 8.
- Morgan, H. H. The practical importance of specifications for materials. Metal progress, Jan., 1932, v. 21: 38-42.
- Namy, M. Rationalisation et organisation scientifique de la production. Paris, Librairie du Recueil Sirey, 1931. 340 p.
- National conference on weights and measures. Report of the twenty-fourth national conference of weights and measures, held at the Bureau of standards, Washington, D. C., June 2-5, 1931. Washington, U. S. Govt. print. off., 1931. 182 p. (U. S. Bureau of standards. Miscellaneous publications, no. 129.) QC100.U57, no. 129.
- National industrial alliance. Rationalisation and displaced labour. London, National industrial alliance, 1931. 20 p.
- Expresses the view that where rationalization is to be carried out the worker should be safeguarded and a fair proportion of the benefit should be reflected in lower prices to the consumer.
- National standardization in Czechoslovakia. Review of results obtained, "quality marks" for products made according to approved standards adopted to insure consumer satisfaction. U. S. Bureau of standards. Commercial standards monthly, Apr., 1932, v. 8: 299-300. HD62.U3, v. 8.
- Deals with the work of the Czechoslovak standards society, the recognized official standards agency for the country.
- Neuhaus, F. Der Verein deutscher Ingenieure und die deutsche Normung. Maschinenbau, June 18, 1931, v. 10: 409-414.
- Historical review of the activities of the Verein deutscher Ingenieure in establishing standards.
- New South Wales. *Statistician's office*. Official year book of New South Wales, 1929-30. Sydney, A. J. Kent, government printer, 1931. 787 p. HC611.A4, 1929-30.
- "Scientific research and standardization" : p. 348. Deals with governmental agencies.
- New York (State). *Executive department. Division of standards and purchase*. Annual report, 1931. Albany, J. B. Lyon Co., printers, 1931. 177 p. (Legislative document, 1931, no. 23.) JK1669.N7A32, 1931.
- "The results of centralization and standardization" : p. 16-20.
- New York trust company's review says standardization stabilizes production and employment. New York Times, Oct. 25, 1931, pt. 2, p. 12, col. 2.
- Nicholson, Joseph W. How standardization effects saving for city of Milwaukee. City purchasing agent outlines standardization plan under which city has saved thousands of dollars. U. S. Bureau of standards. Commercial standards monthly, Sept., 1932, v. 9: 65. HD62.U3, v. 9.
- Orr, John. "Engineering standardization." South African institution of engineers. Journal, Aug., 1931, v. 30: 1-16. TA1.S675, v. 30.
- A review of some accomplishments of the British engineering standards association, and touches upon standards suitable to South Africa.
- Osborne, H. S. Fundamental rôle of standardization in operations of the Bell system. American standards association. Bulletin, v. 2, Sept., 1931: 3-16.
- Deals with the benefits of standardization.
- Pan American commercial conference. 4th, Washington, D. C., 1931. Conference approves measure to have specifications developed for agricultural and mineral products which enter into the Latin American export trade. U. S. Bureau of standards. Commercial standards monthly, Nov., 1931, v. 8: 149-150. HD62.U3, v. 8.
- Park, P. Significance of specifications. Five essential details of purchase specifications outlined. U. S. Bureau of standards. Commercial standards monthly, Nov., 1931, v. 8: 152-153. HD62.U3, v. 8.

- Pissel, Ludwig. *Der Einfluss der Besteuerung auf die Rationalisierung der Wirtschaft*. Berlin, Spaeth & Linde, 1931. 278 p.
- Planned research necessary for standardization in Russia. Technical leadership associated with scientific research, says Soviet union publication. U. S. Bureau of standards. *Commercial standards monthly*, Jan., 1932, v. 8: 211-212. HD62.U3, v. 8.  
English translation of a discussion appearing April 15, 1931, by the editor of the *Bulletin of standardization*, published in Moscow.
- Pleasance, A. V. Science turns purchasing agent. *Management*, v. 38, Mar., 1932: 10, 14-16, 20-21.  
Deals with research and standardization.
- Pontecorvo, Giacomo. *La razionalizzazione in Italia negli scritti e nella realtà*. (*In Società italiana per il progresso delle scienze*. 19. riunione. Rome, 1931. Bd. 2.)
- Price, F. M.:  
Savings through standardization of purchases. *Power plant engineering*, July 1, 1932, v. 36: 525. TJ1.P77, v. 36.  
The standardization work of the Detroit Edison company. *American standards association*. *Bulletin*, Feb.-Apr., 1932, v. 3: 47-59; 85-95; 111-122.  
Includes discussion of the accomplishments and benefits of standardization.
- The progress of standardization in the Scandinavian countries. *International management institute*. *Bulletin*, Nov., 1931, v. 5: 216. T58.A2I852, v. 5.
- Progress of the work of international standardization. *International management institute*. *Bulletin*, Dec., 1931, v. 5: 237-238. T58.A2I852, v. 5.
- Rainey, Fredericka. Commercial standards; what they are and why; how a commercial standard is made. *Practical home economics*, Nov., 1931, v. 9: 340-341; Jan., 1932, v. 10: 13-14. TX341.F85, v. 9-10.
- Randlett, F. M. Standardization of specifications for materials and equipment. *American water works association*. *Journal*, June, 1932, v. 24: 867-874. TD201.A512, v. 24.
- Rather, Allan W. *Is Britain decadent?* London, S. Low, Marston & co. (ltd.) [1931]. 300 p. HC256.3.R3.  
Rationalization in Germany and Great Britain is discussed in chs. 4 and 5.
- Rationalisation and the crisis. *Statist*, May 7, 1932, v. 119: 711-712. HG11.S8, v. 119.
- Rationalisation of Japanese factories. *Mechanical handling*, Oct., 1931, n. s., v. 18: 330. TA1.E555, n. s., v. 18.
- Rationalization. *Index*, Aug., 1931, v. 11: 186-190. HC10.I5, v. 11.  
A discussion of the question in the United States, Great Britain, and Germany.
- Rationalization—a Socialist view. *International management institute*. *Bulletin*, Sept., 1931, v. 5: 165-173. T58.A2I852, v. 5.
- Rationalization at recent trade union congresses. *International management institute*. *Bulletin*, Dec., 1931, v. 5: 229-230. T58.A2I852, v. 5.  
Deals with the Swedish confederation of trade unions, British trades union congress, and the International federation of textile workers' association.
- Rationalization campaign in Norway. *International management institute*. *Bulletin*, Jan., 1932, v. 6: 5. T58.A2I852, v. 6.  
Deals with the establishment of a permanent Rationalization committee which will begin work by organizing a "rationalization week" in February, 1932.
- Rationalization in Europe and America. *Guaranty survey*, v. 11, Aug., 1931: 3-6. HC1.G83, v. 11.
- Rationalization in the Dutch East Indies. *International management institute*. *Bulletin*, Mar., 1932, v. 6: 45. T58.A2I852, v. 6.  
Deals with the establishment of the Standardization board in 1930.
- Rationalization is not mechanization. *International management institute*. *Bulletin*, July, 1932, v. 6: 105-106. T58.A3I852, v. 6.



Rauecker, Bruno. Das soziale Gesicht der Rationalisierung. Zur gleichnamigen Denkschrift des Internationalen Arbeitsamts. Heimatdienst (Berlin), Apr. 1, 1932, v. 12: 105-107.

Ravisse, Gaston:

Organisation scientifique du travail et rationalisation. Génie civil, Aug. 22, 1931, v. 99: 189-191. TA2.G3, v. 99.

Gives arguments for and against rationalization.

La rationalisation. Chaleur et industrie, Aug., 1931, v. 12: 401-405.

Deals with historical development of rationalization and scientific plant organization, rationalization of raw materials and products, economic rationalization, objections against rationalization, etc.

La rationalisation. Les critiques qu'elle soulève. [Zur Genfer Rationalisierungskonferenz. Juli 1931.] Revue industrielle (Paris), Oct., 1931, v. 61: 539-542. T2.R4, v. 61.

Reichskuratorium für Wirtschaftlichkeit. Der Mensch und die Rationalisierung. Fragen der Arbeits und Berufsauslese der Berufsausbildung und Bestgestaltung der Arbeit. Jena, Gustav Fischer, 1931. 370 p.

Reuter, Fritz. Handbuch der Rationalisierung; im Auftrage des Vorstandes herausgegeben vom geschäftsführenden Vorstandsmitglied des Reichskuratoriums für Wirtschaftlichkeit. 3. vollst. neubarb. Aufl. Berlin, Industrieverlag Spaeth & Linde, 1932. 1327 p.

Library of Congress has 1930 edition.

Reynolds, F. W. The determination of quality as a basis for commodity standards. Review of scientific instruments, July, 1932, v. 3: 371-377.

Rickson, John E. Some examples of the benefits of industrial standardization. American standards association. Bulletin, v. 2, Dec., 1931: 17-18.

Robbins, Edwin C., and F. E. Folts. Industrial management; a case book. New York and London, McGraw-Hill book company, inc., 1932. 757 p. TS155.R57.

"Simplification and standardization" : p. 58-116. See also index under these headings.

Roy, Charles. La formule allemande de production rationnelle dans l'industrie; rationalisation contre marxisme. Paris, F. Alcan, 1929. 222 p. T56.R75. Bibliographical foot-notes.

Rubey, Harry. Industrial organization. Boston, New York [etc.], Ginn and Co. [1931]. 308 p. [Engineering series, ed. A. A. Potter.] T56.R8.

"Standardization, simplification, and elimination of waste" : p. 38-41.

Rytel, Zygmunt. Racjonalizacja i wspolpraca przedsiebiorstw. Warszawa, Naklad kniegarni technicznej, 1931. 49 p.

Sarkar, Benoy Kumar. Rationalization in Indian cotton mills, railways, steel industry, and other enterprises. Calcutta, Oriental press, 1930. p. 125-150. (Economic brochures for young India, ser. 2, no. 1.) Also published in Journal of the Bengal national chamber of commerce, Dec., 1930.

Schalldach, Elizabeth. Rationalisierungsmassnahmen der Nachinflationsezeit im Urteil der deutschen freien Gewerkschaften. Jena, Gustav Fischer, 1930. 186 p.

The rationalization measures dealt with are chiefly those which have had the most permanent effects, for instance, the machinery of production, and industrial processes as a whole.

Shapiro, Alexander. Die Arbeiterklasse und die Rationalisierung. Internationale, June-July, 1931, v. 4: 181-186.

Scheffbuch, Adolf. Der Einfluss der Rationalisierung auf den Arbeitslohn. Stuttgart, Kohlhammer, 1931. 334 p.

Deals with the history and theory of rationalization, and its effect on the labor market and wages.

Schlink, F. J. Company standardization as developed by the Siemens-Schukert works at Vienna, Austria. American standards association. Bulletin, v. 2, Jan., 1931: 18-19.

Deals with the organization of the works Standards bureau, standards used, examples of various applications, savings effected, and standard specifications and procedure.

Schlink, F. J.—Continued.

The development of standardization work in Czechoslovakia's largest plant. American standards association. Bulletin, v. 2, May, 1931: 33-36.

Discusses the economics and improvements in production achieved through general introduction of the use of standards and specifications in the Skoda works.

Sherman, Caroline B. Accuracies and refinements in standardization. Journal of home economics, Dec., 1931, v. 23: 1114-1117. TX1.J7, v. 23.

Simplified practice in Australia. U. S. Bureau of standards. Commercial standards monthly, Feb., 1932, v. 8: 253. HD62.U3, v. 8.

Singer, Franz. System der industriellen Rationalisierung. Wien, Spaeth & Linde, 1931. 73 p.

Sloan, M. S. Standardizing practices of merged companies. Electrical world, Feb. 13, 1932, v. 99: 323-325. TK1.E5, v. 99.

Smith, Ralph W. Weights and measures references including an index to the reports of the National conference on weights and measures from the first to the twenty-first, inclusive. Comp. by Ralph W. Smith, senior engineer. October, 1929. Issued January 23, 1930. Washington, U. S. Govt. print. off., 1930. iii, 26 p. 24<sup>cm</sup>. (U. S. Bureau of standards. Miscellaneous publication, no. 103.) QC100.U57, no. 103; QC89.U5S53.

*See especially sections on Specifications; Standardization; and Standards.*

Sobotka, V. Rationalisierung und Weltwirtschaft. Sparwirtschaft, Mar., 1932, v. 10: 88-89.

Society of automotive engineers. Handbook, 1931. Complete supplement. New York, Society of automotive engineers, 1931. 125 p.

Instead of issuing a revised edition of the handbook, the Society has published this complete supplement, containing all new and revised standards and recommended practices adopted since the last book appeared.

Standardisation in the chemical industry; progress made by the British standards institution. Chemical age (London), Dec. 26, 1931, v. 25: 588. TP1.C33, v. 25.

Standardization. A résumé of accomplishments of the recent AN Standards conference and of the Standards committee of the Society of automotive engineers. Aviation, Aug., 1931, v. 30: 485-487. TL501.A8, v. 30.

Standardization a problem for management. U. S. Bureau of standards. Commercial standards monthly, Jan., 1932, v. 8: 221. HD62.U3, v. 8.

Standardization a recognized means of stabilizing employment. American standards association. Bulletin, v. 2, May, 1931: 13-14.

Standardization aids home building. Grade marking of items purchased for use in the home strongly recommended by President's Conference on home ownership. U. S. Bureau of standards. Commercial standards monthly, Jan., 1932, v. 8: 209. HD62.U3, v. 8.

Standardization an aid to industrial progress. Index, Oct., 1931, v. 11: 221-225. HC10.I5, v. 11.

Discusses the benefits of standardization to both producer and consumer.

Standardization and progress. American machinist, Mar. 3, 1932, v. 76: 291. TJ1.A5, v. 76.

Standardization as an aid to retail merchandising. U. S. Bureau of standards. Commercial standards monthly, May, 1932, v. 8: 336. HD62.U3, v. 8.

Standardizing "nonstandard" parts. American machinist, May 26, 1932, v. 76: 690a-690b. TJ1.A5, v. 76.

Argues that clinging to odd sizes because they have been used before is an expensive practice and frequently costs much more than it is worth.

Stewart, Ethelbert. Bureau of labor statistics commends standards. U. S. Bureau of standards. Commercial standards monthly, June, 1932, v. 8: 349-350. HD62.U3, v. 8.

Stocks and standards. American machinist, Apr. 7, 1932, v. 76: 480a. TJ1.A5, v. 76.

Deals with the economy of simplification.



Supreme economic council of the Soviet union. Progress of standardization in the Soviet union. Report to the Council of labor and defense on standardization in industry for 1931. U. S. Bureau of standards. Commercial standards monthly, Dec., 1931, v. 8: 180-182. HD62.U3, v. 8.

States that standardization must be completed in all industries to make possible the 5-year plan in four years.

English translation of article appearing in the Apr. 15, 1931 issue of the Bulletin of standardization, published in Moscow.

The Swedish standards commission. Procedure followed by the Swedish national standardizing agency similar to that of the American standards association. U. S. Bureau of standards. Commercial standards monthly, Apr., 1932, v. 8: 296. HD62.U3, v. 8.

Theory behind rationalization. Saturday review (London), Aug. 29-Sept. 5, 1931, v. 152: 258, 290. AP4.S3, v. 152.

Tillman, S. F. Industrial standardization and mobilization. Plans of the War Department in connection with future industrial mobilization provide for the fullest utilization of commercial standardization. U. S. Bureau of standards. Commercial standards monthly, May, 1932, v. 8: 338-339. HD62.U3, v. 8.

Tokyo industrial institute. Unique facilities for research. U. S. Bureau of standards. Commercial standards monthly, Jan., 1932, v. 8: 216. HD62.U3, v. 8.

Touches upon its standardization activities.

Tomaides, Jaro. Austrian standards committee. Standardization in Austria places particular emphasis on simplification. U. S. Bureau of standards. Commercial standards monthly, Mar., 1932, v. 8: 281-282. HD62.U3, v. 8.

Tomorrow's business power or the economics of "standards." Engineering and contracting, July, 1931, v. 70: 178. TA201.E5, v. 70.

Törnqvist, G. Industriell rationalisering i praktiken. Stockholm, A. B. Affärsökonomi, 1931. 120 p.

Tremelloni, Roberto:

Appunti sui limiti economici dei metodi di razionalizzazione. Organizzazione scientifica del lavoro, Mar., 1931, v. 6: 113-117.

The effects of rationalisation on employment. International labour review, Feb., 1932, v. 25: 198-212. HD4811.I65, v. 25.

Footnote references are given.

Se la razionalizzazione sia causa di disoccupazione. Rivista di politica economica, July-Aug., 1931, v. 21: 816-832.

U. S. Bureau of standards:

Annual report of the Director of the Bureau of standards to the Secretary of commerce for the fiscal year ended June 30, 1931. Washington, U. S. Govt. print. off., 1931. 50 p. (Miscellaneous publication no. 131.) QC100.U55, 1931; QC100.U57, no. 131.

Bureau of standards journal of research. Washington, U. S. Govt. print. off., 1931-32. QC1.U52.

Circular. Washington, Govt. print. off., 1931-32. QC100.U555.

Commercial standards monthly. A review of progress in commercial standardization and simplification, 1931-32. Washington, U. S. Govt. print. off., 1931-32. HD62.U3.

National directory of commodity specifications, classified and alphabetical lists and brief descriptions of specifications of national recognition . . . [Rev. ed.] Prepared by Clarence W. Ingels under the direction of A. S. McAllister, chief of the Division of specifications. Washington, U. S. Govt. print. off., 1932. 548 p. (Miscellaneous publication, no. 130.) QC100.U57, no. 130: HF1041.U6, 1932.

"(Supersedes Miscellaneous publication, no. 65.)"

The work was carried out under the joint auspices of the national Bureau of standards and the Bureau of foreign and domestic commerce. cf. Letter of submittal, p. iii.

Simplified practice recommendations. Washington, U. S. Govt. print. off., 1932. QC100.U575.

## U. S. Bureau of standards—Continued.

- Standards yearbook, 1932. Washington, U. S. Govt. print. off., 1932. 394 p. (Miscellaneous publication no. 133.) QC100.U576, 1932; QC100.U57, no. 133.
- Technical news bulletin, 1931-32. Washington, U. S. Govt. print. off., 1931-32. T1.U45.
- U. S. Bureau of standards' work in 1930 and 1931. Engineering and contracting, Feb., 1932, v. 71:44. TA201.E5, v. 71.
- U. S. Federal trade commission issues statement upholding standardization. New York Times, Apr. 17, 1931, p. 36, col. 7.  
Refers to announcement by C. W. Hunt denying the Federal trade commission opposes commodity simplification.
- U. S. Library of Congress. Division of bibliography. . . . Bibliography on standardization. [Issued April, 1932.] Washington, U. S. Govt. print. off., 1932. 19 p. (Bureau of standards. Miscellaneous publication, no 136.) QC100.U57, no. 136; Z7914.A22U6.  
“(Compiled by Anne L. Baden, Division of bibliography, Library of Congress, under the direction of Florence S. Hellman, acting chief bibliographer . . .)”—p. 1.  
“Supplementary to the lists printed in the Standards yearbook, 1928, 1929, 1930, and 1931.”—p. 1.
- U. S. Superintendent of documents. Standards of weight and measure; tests of metals, thermometers, concrete, iron, electricity, light, clay, radioteleg-raphy, metric system. List of publications relating to above subjects for sale by the Superintendent of documents, Washington, D. C. Wash-ington [U. S. Govt. print. off.] 1932. 87 p. (Price list 64, 18th edition.) Z1223.A191, no. 64, 18th ed.
- Ussiyevich, V. Status of standardization and immediate problems of standard-ization bodies of the United States of Soviet Russia. [Printed in Russian.] Vestnik standarizatsiyi, Apr., 1931, no. 4:1-10.  
A survey of standardization in Russia, and program for 1931.
- Van Steewen, O. P. International standardization. American machinist, Aug. 27, 1931, v. 75:3661. TJ1.A5, v. 75.
- Wainwright, D. B. The value of specifications to industry. Standardization of specifications has been a major factor in attaining industrial leadership. U. S. Bureau of standards. Commercial standards monthly, Nov., 1931, v. 8:135-137. HD62.U3, v. 8.
- Walter, Emil J. Rationalisierung und Fehlrationalisierung. Rote Revue (Zürich), Feb., 1932, v. 11:171-176.
- Warriner, Doreen. Combines and rationalisation in Germany, 1924-1928. London, P. S. King & son (ltd.), 1931. 226 p. HD2859.W15.  
Bibliography: p. 209-222.
- Warwick, C. L. Some aspects of standardization activities in the American society for testing materials. Paper trade journal, June 23, 1932, v. 94:31-32. TS1080.P2, v. 94.  
Deals especially with specifications.
- Whitehead, T. N. Planning standardized components to secure variety in prod-ucts. Harvard business review, Apr., 1932, v. 10:257-268. HF5001.H3, v. 10.
- Die Wirkungen der Rationalisierung. Metallarbeiter-Zeitung, Apr. 25, 1931, v. 49:135.
- The Working man and rationalisation in Norway. International management institute. Bulletin, July, 1931, v. 5:129. T58.A21852, v. 5.
- Wurz, Franz. Unfallverhütung und Rationalisierung. Sparwirtschaft, Mar., 1932, v. 10:91-92.
- Zaalberg, C. J. P. La rationalisation en chiffres. Société Belge d'études et d'expansion. Bulletin périodique, Dec., 1930, v. 78:556-564.  
An analysis of official Netherlands statistics from 1922 through 1929 showing an increase in rationalization of industry concurrent with an increased rate of production per worker.



# INDEX

## A

	Page
Abbreviations, scientific and engineering.....	186
Abdominal packs, specifications for.....	174
Abrasive cloth and paper.....	172
Abrasive wheels.....	200, 203, 226
Absorption of concrete.....	168
Accelerometers for study of earthquakes.....	128
Accident prevention.....	185, 210, 212
Accident statistics.....	75
Accounting systems.....	89, 204
Acetylene gas cylinders.....	203
Acid in leather.....	129
Acoustical materials and measurements.....	113, 166
Adding machines.....	58
Adjusting rings.....	66
Adsorption-desorption studies.....	148
Aeronautics.....	62, 108, 225
Aggregates.....	212, 218, 219, 221
Agriculture.....	60
Air circuit breakers.....	213
Air compressors.....	197, 223
Air furnaces in residences, installation of.....	186
Air humidity, effect of, on engine performance.....	111
Air navigation.....	73
Aircraft construction.....	53
Aircraft engines.....	93, 108, 109
Aircraft steels.....	224
Alarm systems, burglar.....	228
Alcohol, ethyl, preparation of tables of properties of.....	149
Alloy steels.....	224
Alloys, dental amalgam.....	175
nonferrous.....	53, 168, 169, 224
white metal.....	53
wrought gold.....	175
Altitude testing of aircraft engines.....	109
Aluminum alloys.....	224
American Institute of Laundering.....	204
American lumber standards.....	171
American Marine Standards Committee.....	166
American Society for Testing Materials.....	167
Amusement parks, safety code for.....	210
Analyses, water and sewage.....	182
Analytical reagent chemicals.....	115
Animal oils.....	220
Antennas, radio.....	202
Antiseptics.....	208
Appliances, fire.....	213
gas.....	177
Apricots, canned.....	195
Arches, laminated wood.....	210
Architecture.....	178
Arlington Memorial Bridge, tests of.....	113
Asbestos.....	190
Asbestos roving.....	168
Ash handles.....	190
A. S. M. E. boiler code.....	187
Asphaltic products.....	50, 62, 168, 190
Astronomical Union, International.....	4
Atomic structure.....	143
Attachment plugs.....	213, 228
Automatic block signal system.....	184
Automatic sprinklers.....	223
Automobile brakes.....	111
Automobile construction.....	52,

53, 58, 111, 167, 201

	Page
Automobiles.....	61, 63
Automotive engineering.....	110
Automotive radio.....	222
Aviation.....	63
Aviator's hose.....	207
Axles, steel.....	60

## B

Bacon, sliced, packing of.....	201
Bag leather.....	226
Bags, grocers'.....	204
ice.....	51
paper.....	217
Baking.....	186
Ball bearings.....	65, 66
Balloons, rubber.....	139
Balls, golf.....	228
volley.....	172
Bar steels.....	192
Barrels.....	191, 203, 221
Bars, iron and steel.....	53,
165, 169, 188, 192, 193, 197, 199, 222	
Base plates.....	203
Base, slag.....	218
Baseball, indoor.....	172
Basins, hospital.....	51
Basket ball.....	172
Baskets, apple.....	203
Batteries, flashlight, packaging of.....	219
storage.....	122, 179, 184, 213
Beams, laminated wood.....	210
rolled iron.....	54
Bearing alloys.....	133
Bearings, antifriction.....	194, 225
Bed sheets, serviceability of.....	146
Beds.....	178, 194, 207
Beds and cribs, mattresses for.....	178
Beech flooring.....	205
Beef, dried.....	201
Bell Telephone System.....	227
Belting.....	49, 60, 61, 62, 64, 179, 223
Benzic acid, thermal expansion of.....	137
Better Fabrics Testing Bureau.....	217
Beverage bottles.....	173, 193
Bibliography on standardization.....	231
Bins, table.....	199
Biological products.....	96, 188, 196
Birch flooring.....	205
Bituminous road building materials.....	50, 168
Bituminous pavements.....	187
Blades, hacksaw.....	200, 226
mowing machine.....	56
razor, packaging of.....	219
Blades for truck scrapers.....	186
Blankets.....	56, 177, 209, 217
Blanks, thread plug and ring gage.....	176
Blinds.....	206
Block, gypsum.....	200
Block pavements.....	215
Block signal, railway.....	184
Blocks, paving, wood.....	50
Blouses, boys'.....	192
Blow torches, gasoline.....	218
Blower systems.....	190, 213
Blowers, centrifugal.....	186
Blowpipes.....	203
Board, binders.....	194
insulating, fiber.....	220
roofing, asphalted.....	50
Boards, gypsum.....	200
Boiler Code, A. S. M. E.....	187
Boiler drums, welding of.....	189





	Page
Codes, building	195, 214
car service rules	185
electricity meters	212
evaporator test	178
fire protection equipment	209
power-test	187
protection against lightning	179
refrigerators	187
safety, standard	208
street-traffic signs, signals, and markings	173
the lighting of school buildings	212
unfired pressure vessels	174
vehicle	211
Coffee boxes	221
Coke	55, 61, 169
Cold-water paints	214
Colorimetry	118
Colors for sanitary ware	202
Columbus laboratory of the Bureau of Standards	117
Combustion in engine cylinder	111
Combustion, phenomenon of	111
Commercial forms	208
Commercial screens	212
Commercial standardization work of the Bureau of Standards	102
Commercial standards	119
Committee on Uniform Street and Sanitation Records	210
Communication, railway	227
Compounds, cleaning	207
Compressors, air	197, 223
refrigerating	187
Concrete	50, 113, 174
Concrete aggregates	221
Concrete arches	186
Concrete building units	221
Concrete, cement, Portland	185
Concrete mixers	191
Concrete pavements	186
Concrete, ready-mixed	215
reinforced	174, 197
building code for	197
reinforcing bars for	112
Concrete ribbed floor	197
Concrete structures	49
test methods for	168
Condensers	53
Conductors, hard-drawn aluminum working, overhead	179
Conduit, flexible, nonmetallic	188
flexible steel	213
Conradson carbon residue	228
Constants, tables of	166
Construction, overhead, trolley bus track and pavement	216
Containers, canned food	188
	56,
195, 198, 199, 203, 205, 219, 221	
Containers for compressed gases	63
Containers, fiberboard	208
shipping	183, 195, 197, 203
solid-fiber	221
steel, for compressed gases	62
storage, for liquefied petroleum gas	197
Controls, receiver	222
Control apparatus, electric railway	165
Convection, heat transfer by	126
Conveyors and conveying machinery, safety code for	210, 225
Conversion tables	53, 166
Cookers, gas	58
Cooperative fuel research	181
Copper alloys	224
Copper, electrodeposition of	199
Copper research	197
Copper roofing	134
Core materials	216
Core screws	63
Corn oil	180
Cornstalks, insulating board from	147
Corrosion of cast iron	196
Corrosion of metals	132, 199
Cotter pins	54, 65
Cotton cloth for rubber and pyroxylin coating	198

	Page
Cotton fabrics_____	227
fastness of light to_____	207
Cotton goods_____	202, 227
Cotton textiles, hospital and insti- tutional_____	178
Cotton textiles for aeronautics_____	146
Cotton waste_____	209
Cottonseed products_____	180, 211, 220
Council on Dental Therapeutics_____	175
Counters, cafeteria_____	199
County purchasing agencies_____	151
Couplings_____	53, 56, 58, 63, 66, 166, 224
Cover paper_____	198
Covers, cotton fabric_____	198
manhole_____	227
Cranes_____	49, 193, 223, 224, 225
Creosote oil_____	189
Cribs and beds, mattresses for_____	178
Crossings_____	185, 205, 211
Crystallography of organic com- pounds_____	137
Cups, ice cream_____	198, 203
Currency paper_____	136
Currents, electrical_____	54
Cushions, hospital_____	51
Cut nails_____	217
Cut-outs, electrical_____	52
Cut tacks_____	217
Cutlets, pork feet_____	201
Cutters, milling_____	49, 206
Cyanide plating baths_____	115
Cylinder locks_____	201
Cylinders, acetylene gas compressed gas_____	203
Cypress lumber_____	197
	213, 225

## D

Dams	186
Dansk Standardiseringsraad (DS)	55
Decimal classification	58
Deck equipment for vessels	174
Definitions, electrical	179
Dental instruments and materials	58
Derricks	120, 175
Dial lamps	225
Diameters, standard	56, 61
Diaphragm pumps	191
Die castings	224
Dielectric strength, testing for	169
Diesel engines	198
Diesel fuels	168
Dining-car chinaware	189
Discuss	172
Disease, nomenclature of	73
Disinfectants	207
District heating	212
Dividing engine, precision	135
Domestic and industrial fuel oils	180, 181
Doors	63, 166, 201, 206
Doubletrees, sizes for	218
Douglas fir	229
Down (feathers)	194
Dragnines	223
Drain tile	175, 196
Drainage of coal mines	165
Drawings, technical	55, 56, 61, 62, 66
Dress trunks	214
Dressings, surgical	174, 178
Dried beef	201
Drill fittings, diamond-core	181, 198
Drills	61, 63
twist	206
Drinking fountains	182, 189
Drugs	72, 96, 175, 181, 194, 216, 228
Drums, boiler, welding of	189
Dry-cleaning solvents	146, 207
Dry skim milk	176
Duralumin, prevention of embrittle- ment of	133
Dust explosions, safety code for the prevention of	165, 222
Dusts, inflammability of	75
Dyed fabrics, fastness to light of	173
Dyes	145
Dyestuffs, fastness of	173





	Page
Gas analysis and service-----	123
Gas appliances-----	50, 124, 177
Gas boilers, industrial-----	177
Gas carburizing-----	188
Gas, city-----	213
Gas cocks-----	58
Gas, elimination of hazards in use of-----	124
Gas-heated ironers-----	177
Gas machines, gasoline vapor-----	213
Gas masks-----	63
Gas meters-----	58
Gas oils, testing of-----	166
Gas ranges-----	165, 177
Gas refrigerators-----	177
Gas regulators-----	203
Gas tubing, flexible-----	177
Gas water heaters-----	177
Gases, compressed-----	203, 213, 218
Gases, liquefied-----	213
Gases in metals-----	131
Gases, petroleum, liquefied-----	209
Gases, P-V-T data for-----	137
Gaskets-----	184
Gasoline-----	110, 168, 169, 209
Gasoline blow torches-----	218
Gasoline vapor gas machines-----	213
Gearing, spur and helical-----	49
Gears-----	177, 188, 194
Geodetic activities, international-----	8
Girdler rails-----	213
Glass-----	50, 174, 266
Glass containers-----	195, 198, 199, 205
Glass, nonshatterable, tests for-----	166
Glass, optical-----	124
Glassware, laboratory-----	53, 208
Glazing-----	50, 206
Gloves, surgeons'-	178, 223
Glycerine-----	192, 199
Gold alloys, wrought-----	175
Gold, inlay casting-----	175
Golf balls and clubs-----	228
Golf shafts, hickory-----	214
Grain-----	206
Grain scales-----	141
Grain standards-----	199
Granulated slag-----	218
Grapes, muscat, canned-----	195
Gravel-----	189, 218
Gravity, absolute determination of-----	137
Gravity measurement-----	216
Greases, vehicle-----	51
Grey goods-----	199
Grinding wheels-----	200
Ground thread taps-----	205
Guard rails-----	205
Gypsum-----	50, 58, 130, 169
Gypsum products-----	130, 209

## H

Hacksaw blades	200, 226
Hampers, apple	203
Hand trunks	214
Handball	172
Handbook of Physical Therapy	188
Handles, ash	190
hickory	201
Hardware, builders'	201, 217
Hardwood lumber	213, 214, 200
Hardwood molding	200
Harrow	56
Hay, baled	214
Headlight adjustment	173
Headlight testing	173
Hearths, brick	51
gas	58
Heat and temperature measurement	125
Heat transmission	216
Heaters, freight-car	223
water, gas, garage and electric	58,
	177, 190, 193
Heating appliances	50
Heating, district	212
Heating systems	186, 200, 219
Helium, liquid, electrical properties of	126
Hemlock lumber	220, 229
Hickory golf shafts	214

	Page
Hickory handles-----	201
Highway bridges, specifications for-----	173
Highway coaches-----	223
Highway crossing signs and signals-----	185
Highway trucks-----	223
Hinges, butt-----	201
Hockey, ice-----	172
Hoisting appurtenances-----	62
Hoisting chains-----	218
Hoists-----	49, 225
Holders, lamp, base-----	228
Home economics-----	177
Home financing-----	112
Homeopathic Pharmacopœia of the United States-----	179
Hoops-----	191
Horological Institute of America-----	147
Horticultural nomenclature and standards-----	172, 187
Hose, aviator's-----	56
	138, 207, 217, 223, 228
Hosiery boxes-----	207
Hosiery lengths-----	207
Hospital and institutional cotton textiles-----	178
Hospital equipment-----	51, 63, 178, 189
Hospital plumbing fixtures-----	189
Hot plates-----	177
Hot-water appliances-----	50
Hot-water heating-----	186
Hot-water supply apparatus-----	51
Hotel chinaware-----	189
Hotel and restaurant ranges-----	177
House painting-----	53
Household refrigerators-----	179
Hulls, cottonseed-----	211
fusion welded-----	189
Humidifier practice in baking plants-----	186
Hydrants-----	189
Hydraulic pumps-----	201
Hydraulics-----	126
Hydrogen, isotopes of-----	137, 143

I

Ice chest sizes.....	49
Ice cream boxes.....	221
Ice cream cans..... 198, 203,	206
Ice cream cartons.....	198, 203
Ice cream cups.....	198, 203
Ice cream molds..... 198,	203
Ice plants, steam-driven.....	187
Idaho white pine.....	229
Identification problems.....	127
Ignitibility.....	75
Ignition cable.....	224
Ignition equipment, radio shielded.....	110
Illuminants, color grading of.....	119
Illumination, International Commis- sion on.....	12
Impedance bond.....	184
Implements, tillage.....	207
Incinerators..... 177,	223
Indicator cocks and cards.....	49
Inductors.....	222
Inflammability of dusts.....	75
Inlay casting golds.....	175
Inlay casting waxes.....	175
Insecticides, household.....	207
Institute of Scrap Iron and Steel.....	208
Instruments, aircraft.....	109
Instruments and appliances.....	127
Instruments, dental.....	513
electrical measuring..... 60, 61, 68, 179, 213	28
surgical.....	58
Insulating board from cornstalks.....	147
Insulating board, fiber.....	220
Insulating materials..... 166,	216
Insulating properties of rubber.....	139
Insulating tape..... 182,	185
Insulators..... 18, 51, 54, 56, 60, 62,	179
Interlocking plants, testing of.....	184
Interlocking rules, railway.....	184
International Commission on Illumi- nation.....	12
International Commission for Uni- form Methods of Sugar Analy- sis.....	18

	Page		Page
International Congress on Light.....	17	Lighting equipment.....	201
International Congress of Scientific and Applied Photography.....	16	Lighting installations.....	225
International Electrical Congress.....	13	Lighting, school.....	201, 212
International electrical units, main- tenance of.....	120	Lightning arresters, rods, and codes .....	58, 65, 179, 214
International Electrotechnical Com- mission.....	9	Lignite.....	61
International Federation of Stand- ardizing Associations.....	13	Liquefied gases.....	213
International geodetic activities.....	8	Liquid soaps.....	208
International Scientific Radio Union.....	12	Liquids, flammable.....	213
International Standardizing agen- cies.....	3	Lime.....	50, 58, 130, 174, 214
International temperature scales.....	126	Limestone.....	174
Inter-Society Color Council.....	182	Lines, pipe, petroleum.....	209
Ionized layer, height of.....	139	Lining, closet, red cedar.....	190
Iridium, freezing point of.....	126	Lintels, concrete.....	49
radiation from molten.....	119	Lithographic papers.....	136
Iron, cast, gray.....	199	Loaded paper shot shells.....	217
magnetic properties of.....	168	Loading platforms.....	225
Ironers, gas-heated.....	177	Locks.....	58, 201
Irons, electric.....	54	Locomotives.....	53, 180, 183, 212
Irrigation hydraulics.....	186	Lovibond glasses, calibration of.....	118
Isotopes of hydrogen.....	137	Lowell Textile Institute.....	173
<b>J</b>		Lubricants.....	51, 58, 75, 224
Janitor supplies.....	218	Lubricating apparatus.....	58
Jar containers.....	201	Lubricating oils.....	123, 207, 224
Javelin.....	172	Lugs, terminal.....	212
Joiners' work.....	53	Lumber.....	62, 171, 190, 195, 210 213, 214, 220, 225, 229
Joint Committee on Foundry Refrac- tories.....	176	Luminaries, residence-lighting.....	193
Joint Committee on Pattern Equip- ment.....	176	<b>M</b>	
Joint Committee on Raw Silk Classi- fication.....	224	Machine bolts, standard packing of.....	207, 226
Joint Concrete Culvert Pipe Com- mittee.....	175	Machine tool elements.....	206, 225
Joists, steel.....	226	Machine tools.....	56, 66
wood.....	229	Machinery, electrical.....	51, 53, 54, 56, 58, 61, 62, 65, 208
<b>K</b>		laundry, safety code for.....	204
Keene's cement.....	130	textile.....	58
Keys.....	191	Machines, adding.....	58
Keys.....	54, 55, 56, 61, 66	excavating.....	223
Keyways.....	55, 61	gas, gasoline vapor.....	213
Kitchen equipment.....	63, 199	weighing.....	218
Knife switches.....	213	Magnetic testing.....	122
<b>L</b>		Manhole frames and covers.....	186, 227
Labeling.....	52, 54, 57, 60, 170, 217	Manila rope.....	198, 228
Laboratory apparatus.....	223	Mannose, new compounds of.....	145
Laboratory glassware.....	208	Manometers.....	63, 66
Lactone.....	144	Maple flooring.....	205
Ladders for mines.....	180, 196	Mapping.....	186
Lag bolts, standard packing of.....	226	Marine fire hazards.....	213
Lamp sockets.....	62, 213	Marine products.....	192
Lamps, dial.....	222	Markings, code of.....	173
incandescent.....	52, 54, 62, 193, 213	Markings, street traffic.....	196, 211
signal and switch.....	185	Masonry opening sizes.....	223
Lanterns, railway.....	184	Masonry units, concrete.....	221
Larch.....	229	Mattresses.....	178, 194, 207
Lath.....	197	Measurement, gravity.....	216
Lathe attachment for turning spheri- cal surfaces.....	128	Measuring devices.....	211
Lathe centers.....	49, 60	Measuring instruments, electrical.....	213
Lathing.....	197	Meats, smoked.....	201
Laundering methods.....	204	Mechanical power-transmission appa- ratus, safety code for.....	203, 210
Laundry stoves.....	177	Mechanical refrigeration.....	208
Laundry tubs, cement.....	49	Mechanical sanitation.....	188
Laws, traffic, standardization of.....	196	Medicinal plants.....	216
Lead pipe, sizes of.....	204	Medicines.....	228
League of Nations.....	70	Melting pots, brass.....	221
Leather products.....	60, 63, 129, 179, 226	Mercury-arc rectifiers.....	179
Ledgers, sizes of.....	230	Mercury, dental.....	175
Letter box plates.....	201	Metal molding.....	213
Letterheads.....	66	Metal waste.....	209
Levulose.....	145	Metals, ferrous and nonferrous.....	56, 58, 61, 62, 63, 126, 130, 188, 199, 215
Light waves, use of, for production of end standards.....	135	Meters.....	56, 58, 177, 189, 212
Lighting, automotive.....	201, 224	Metrology.....	134
Lighting, codes.....	166, 201	Mica, grading of.....	169
Lighting, electric, for cars and loco- motives.....	184	Mileage voucher.....	88
		Milk analysis.....	194
		Milk bottles, sizes and dimensions for.....	203
		Milk cans.....	206
		Milk products.....	172, 176, 192, 196
		Mill lighting, code of.....	201
		Milling cutter profiles for dressing lumber.....	63
		Milling cutters.....	49, 206



	Page
Mills, flour, fire protection for	213
Mine cars	50
Mine scales	141
Mine timbering	180
Mine tools	50
Mineral aggregates	219
Mines, coal	75
metal, electrical equipment in	165
wire rope for	196
Mining of bituminous coal	179, 210
Mirrors, mouth	175
plate glass	206, 207
Misregister, investigation of	136
Mixers, concrete	191
Molding patterns	195, 200
Moldings, metal	213
wood	171, 214, 229
Molds, ice cream	198, 203
Molybdenum salts and compounds	168
Mortars, volume changes of	114
Motion-picture apparatus	166, 225
Motor traffic	211
Motor trucks	224
Motor-vehicle specifications	111, 224
Motor-vehicle lighting	225
Motors	62, 179, 187, 193, 212
Mountings, carburetor	224

## N

Nails, cut	217
Naphtha, cleaners	205
Narcotic drugs	216
National Directory of Commodity Specifications	142
National Formulary	181
National (governmental) standardizing laboratories	22
National Hydraulic Laboratory	126
National industrial standardizing bodies	47
National Screw Thread Commission	94
Naval construction	56
Neck yokes, sizes for	218
Needles, dental hypodermic	175
New and nonofficial remedies	180
Nickel, electrodeposition of	199
Nipples, pipe	181, 198, 201, 208
Nitriding	188
Noise, reduction of, in airplanes	108
Nomenclature, horticultural	181
pharmaceutical	181
Nonferrous metals	62, 63, 67, 131
Nonmetallic flexible conduit	213
Nonmetallic materials	61
Northeastern Lumber Service (Inc.)	220
Nutrition	74
Nuts	51, 56, 61, 65, 224

## O

Oak flooring	221
Oil burners	53, 180, 209, 228
Oil-burning equipments	213
Oil Heating Institute	180
Oils	37,
51, 62, 166, 168, 180, 181, 189, 192, 207, 208, 209, 211, 219, 220, 223, 224,	
Ores	67, 165, 189
Orifice meters	123, 177
Outboard motor standards	224
Outlet boxes	213
Ovens, brick	51
gas	58
Overhead construction, trolley bus	188
Overhead systems	212

## P

Packing, fruit and vegetable	63
Padlocks	184
Pads, sterile gauze	174
Paint brushes	217
Paints	50, 60, 62, 169, 181, 202, 214
Paper	56, 135, 198, 205, 209, 216, 222
abrasive	172

Paper bags	217
Paper shot shells	226
Paper sizes	58, 62, 64, 66, 181, 204, 208, 230
Paper, toilet	227
waste	209, 229
Paraffin waxes	166
Parks, amusement, safety code for	210
Partitions, soundproofed	113
Paste, wood	210
Patterns, foundry, wood	106, 205
marking of	49, 53
molding	200
Pavements	186, 187, 188, 215
Pavers	191
Paving blocks, wood	50
Paving brick	215
Paving materials	63, 169
Peaches	195
Peanut oils	181, 211
Pears, canned	195
Peas, canned	195
Permeability of concrete	168
Petroleum, gumming of	216
hydrocarbons from	115
Petroleum oil tables, extension of	149
Petroleum pipe lines	209
Petroleum products	56, 166, 167, 215
Pharmaceuticals	96, 181
Pharmacopoeia of the U.S.A.	228
Phase-equilibrium diagrams	138
Photography	136
Photometric standards	201
Photometry	118
Physical constants	137
Physical Therapy, Handbook of	180
Pigments	49
Piles, concrete	213
timber	213
Pillows	178, 194
Pin reamers	206
Pine lumber	226, 229
Pinions	194
Pins	56, 225
Pipe flanges	61, 165, 166, 201
Pipe, metallic and nonmetallic	50,
53, 54, 56, 58, 61, 62, 65, 168, 189, 175, 184, 189, 192, 195, 196, 201, 203, 204, 205, 209, 212, 213, 223, 226,	
Pipe nipples	181, 198, 201, 208
Pipe systems	53, 66, 186
Piping, pressure, standard code for	208
refrigerating	179
Piston rings	224
Planks	226, 279
Plants, medicinal	216
power, electrical equipment of	194
woodworking, safety code for	203,
210, 221	
Plastering	197, 214
Plasters, gypsum	200
Plates, base	203
bone, steel	174, 178
flat, strength of	108
letter box	201
light	193
printing	203
rating	51
tie, steel	192
vitreous	50
Platforms, loading	225
Platinum metals	115
Playground apparatus	216
Plows	207
Plugs, electrical	52, 213, 228
Plumbing codes	112
Plumbing equipment, standardization of	187
Plumbing fixtures	166, 189, 198, 202
Plumbing investigations	127
Plummer blocks	49
Plums, canned	195
Plywood	214
Pole butts, preservative treatment of	189
Pole vaulting	172
Poles, concrete	213
wood, concrete	188, 213, 221, 227





	Page		Page
Sections, drawn steel	53	Sprinklers, automatic	223
rail	188	Sprockets, transmission	225
Seed investigation	71	Spruce	220
Seed testing, rules for	194	Stained paper	56
Seismometers, development of	128	Stains, biological	196
Sensitometry, photographic	136	Stairs and ladders for mines	180, 196
Service meters	189	Stairwork	206
Set-up boxes	217	Stamp paper	136
Sewer pipe, clay	196	Stanchions	62
Sewers	62, 187	Standard Code of the American Rail- way Association	184
Shackles	63	Standard Handbook of Steel Con- struction	179
Shaft couplings	53, 166, 224	Standard safety codes	208
Shaft diameters	63	Standard samples	115
Shaft ends	63, 66	Standardization, bibliography on	231
Shaft heights	51, 66	Standardization of plumbing equip- ment	187
Shafts, golf, hickory	214	Standardization of traffic laws and regulations	196
ventilation	50	Standardizing agencies, interna- tional	3
Shanks, taper	63	Standardizing Associations, Interna- tional Federation of	13
Shapes, metallic	49, 62, 169	Standardizing laboratories, national governmental	22
Sheaves	63	Standpipes, steel	189
Sheet asphalt course	190	State purchasing agencies	155, 160
Sheet, magnesium alloy	169	States, cooperation with on weight and measures matters	150
Sheeting, rubber	178, 223	Staves, barrel	191
Sheets	177	Staybolt taps, spindle	206
pyroxylin	222	Steam boilers	201, 209
Shellac	115, 147, 166, 228	Steam-driven ice plants	187
Shells, shot, paper	217, 226	Steam heating	186
Shelves	199	Steam railways, electrical equipment of	194
Shingles	171, 191, 214, 220, 223	Steam tables	199
Shipbuilding, fittings for	62	Steam, thermal properties of	125
Shipbuilding standards	166	Steam unit ventilators, testing and rating of	186
Shipping containers	195, 203	Steamer trunks	214
Shirts	192	Steel, 51, 53, 62, 168, 188, 192, 193, 213, 224	224
Shoe tapes	168	Sterile gauze dressings	174
Shovels	223	Stoddard solvent	168, 207
Shower bath standards	172	Stone	61, 144
Shutters	206	alluvial	58
Sidewalks	187	Stone ballast, specifications for	185
Sieves	56	Stone block pavement	187
Signaling apparatus	213	Stone, building	168
Signaling circuits	184	cast	49, 114, 196, 221
Signaling systems, fire alarm	223	natural	50, 62
Signals, code of	173	paving	63
street traffic	62, 196, 211	Storage batteries	179, 184, 213
Signs, electric	53	Storage containers, liquefied petro- leum gas	197
Signs and signals, highway crossing	185	Stoves, electric	54
Signs, street traffic	196, 211	laundry	177
Silks	215, 224	Strap leather	226
Simplified practice	141	Straw, baled	214
Singletrees, sizes for	218	Street lighting, code of	201
Sinks	199	Street maintenance standards	204
Sirup, sugar strength of	195	Street sanitation	215
Slabs, plaster, slag, and cement	50	Street traffic signs, markings, and signals	173, 196, 211
Slag	50, 218	Structural timber	226
Slate	61, 75, 144, 191	Structures, concrete	49, 53
Slices, pork feet	201	welded steel	50, 53
Smoked meats	201	Stucco	197, 214
Soaps	181, 192, 207, 208, 211	Sugar	144
Sockets, electrical	52, 62, 66, 213	Suitcases	214
tube	165, 222	Sulphonated oil	209
Soda acid fire extinguishers	220	Surface qualities, classification and designation of	166, 187
Softwood lumber	138	Surgeons' gloves	178, 223
Soil corrosion	58	Surgical dressings	174, 178
Soil drainage	168, 207	Surgical instruments	58
Solvents, dry-cleaning	225	Surveying	58, 186
Sound equipment	225	Sweetpotato starch	148
Sound film	113	Swimming	172
Soundproofed partitions	113	Swimming pool standards	172
Soybean oil	181, 211, 219	Swiss Technical Review	66
Space heaters	177	Switches	51,
Spark character, measurement of	110	52, 53, 54, 60, 185, 205, 213, 222	222
Spark plugs	56	Symbols and abbreviations	52,
Spark testing of steels	134	55, 58, 62, 63, 165, 166	187
Specific heats at low temperatures	125	Synchronous motors	
Specifications	89, 142		
Spectrochemical analysis	143		
Spectrographic analysis	167		
Spherical surfaces, device for turn- ing	128		
Spindles, yarn, worsted	58		
Spiral rods, steel	197		
Splice bars	188		
Splices	61, 224		
Sponges, specifications for	174		
Spools, porcelain	51		
Spring materials	134		
Springs	188, 194, 207		

T		Page		Page	
Table tops	-----	199		Tubing, metallic and nonmetallic	61,
Tables, hospital	-----	51			64, 108, 169, 212
steam	-----	199		Tubs, butter, standard dimensions of	191
Tacks, cut	-----	217		Tubs, laundry, cement	49
Tamarack lumber	-----	220		Turnouts	205
Tank car devices, testing of	-----	184		Twine	198, 201
Tanks	109, 149, 189,	223		Twist drills	206
Tapes	168, 169, 182, 185,	206			
Taps	-----	205, 206			
Tarpaulins	-----	198, 219			
Technical societies	-----	172			
Telegraph	-----	185			
Telephone	-----	185			
Television	-----	222			
Tents	-----	198, 219			
Terminal lugs	-----	212			
Test bars	-----	199			
Test code, insulation	-----	223			
Testing and rating steam unit venti-	-----				
lators	-----	186			
Testing, brake	-----	216			
Testing at the Bureau of Standards	-----	102			
Testing machines, calibration of	-----	127			
Testing radiators	-----	186			
Testing steam heating boilers burn-	-----				
ing oil fuel	-----	186			
Testing tank car devices	-----	184			
Tests of welds	-----	174			
Textiles	55, 60, 62, 63, 145,	167			
Textile machinery	-----	58			
Therapeutic accessories	-----	147			
Thermal expansion measurements	-----	149			
Thermocouple materials	-----	126			
Thermometers	66, 178, 219				
Thimbles	-----	63			
Thread gages	-----	181			
Threads, screw	54, 61, 66,	224			
Tidbits, vinegar pickled	-----	201			
Tie plates, steel	-----	192			
Tie rails	-----	213			
Tie rods	-----	188			
Ties, concrete	-----	213			
timber	-----	213			
Tile	49, 50, 61, 175, 192, 196,	226			
Tillage implements	-----	207			
Timber	50, 62, 171, 226,	229			
Timbering, mine	-----	51, 180			
Time measuring and recording in-	-----				
strument	-----	147			
Timepieces, testing of	-----	147			
Tire tube sizes	-----	223			
Tires, balloon	-----	227			
railway car	-----	52			
Toasters, electric	-----	193			
Toilet paper	-----	227			
Toe boards, safety code for	-----	165			
Tomatoes, canned	-----	195			
Tools	50, 56, 66, 185, 213, 217,	225			
Torches	-----	203, 218			
Torpedoes, track	-----	184			
Track construction	-----	188			
Track cranes	-----	224			
Track scale, railway	-----	218			
Trade associations	-----	172			
Trade standards	-----	207			
Traffic control system	-----	184			
Traffic laws, standardization of	-----	196			
Traffic, motor	-----	211			
Traffic signs, markings and signals	-----	62,			
	-----	196, 211			
Transformers	58, 62, 65, 165, 222,	228			
Transmission belts	62, 64,	223			
Transmission chains	-----	216			
Transmission, heat	-----	225			
Transmission lines	-----	182			
Transmitters, radio	-----	202			
Transportation	-----	185			
Trestles	-----	223			
Trimmers, wall tile	-----	192			
Trolley busses, fire protection for	-----	213			
Trolley-wire design	-----	188			
Trucks, colliery	-----	58			
motor	-----	224			
Trunks	-----	214			
Tube sockets	-----	222			
Tubes	49, 51, 64, 65, 168, 169, 192,	222			
vacuum	-----	202			

## U

Ultra sonic waves	138
Ultra-violet dosage intensity meter	147
Ultra-violet radiation	147
Underwear, knit	191, 217
Unions, screwed, iron or steel	201
pipe	66
Unit weights for the purchase of re-	
agents	174
United States Pharmacopœia	181
Units, concrete	221
Upholstery leather	226
Use of explosives in bituminous coal	
mines	196, 202

## V

Vacuum and pressure gages	179
Vacuum cleaners	54, 190
Vacuum meters	63
Vacuum tube numbering	222
Vacuum tubes	165, 202
Valves	52,
53, 61, 184, 185, 189, 205, 223,	226
Vapor-lock investigation	110
Varnish	60, 181, 202
Varnish brushes	217
Vaults, burial, concrete	174, 221
Vegetable containers	203
Vegetable oils	220
Vehicle code	211
Vehicles, motor	224
Veneers	213
Ventilation of buildings	186
Ventilation, coal mine	180
Ventilation shafts	50
Ventilators	62
steam unit, testing and rating of	186
Vessels, deck equipment for	174
pressure	174, 189, 209, 216
Veterinary biological products	188
Vinegar pickled tidbits	201
Vitamin research	71
Vitreous enamels	124
Vitrified brick pavements	215
Volley ball	172
Voltagages, electrical	54, 62, 121

## W

Wagons, farm	63
Waidner-Burgess standard of light	119
Waists, boys	192
Wall paper	219, 229
Wardrobe trunks	214
Warehouse forms	194
Wares	174, 202
Warm-air furnaces	219
Warm-air heating systems	219
Washers	51, 56, 61,
Washroom formulas	205
Waste	209
Waste paper	229
Waste products from the land	147
Watch rate, study of	147
Water, absolute viscosity of	137
Water and sewage analysis	182
Water filters, pressure	189, 192
Water heaters, electric	193
Water, industrial, analysis of	167
refractive index of	137
Water softening plants	185
Water supply	53
Water, thermal properties of	125
Waterways	186
Waterproofing compounds	114
Waxes	133, 166,
Wear resistance of metals	133



	Page		Page
Webbing, automotive-----	168	Woodworking plants, safety code	
Weighing devices-----	211	for-----	203, 210, 221
Weighing machines-----	218	Wool blankets, labeling of-----	217
Weights and measures-----	148, 179	Wool processing-----	146
Welded steel floors, fire tests of-----	122	Woolen rags-----	209
Wheel contours-----	188	World calendar-----	230
Wheels-----	60, 63, 227	Wrestling-----	172
Wheels, abrasive-----	66, 200, 203, 226	Wrought gold alloys-----	175
brush-----	175		
buffing-----	198		
grinding-----	200		
dental-----	175		
Whiteware bodies, special low-fire-----	116		
Whitewash-----	214		
Windows-----	63, 206		
Wiping cloths-----	219		
Wire cloth, Pourdrinier-----	229		
Wire rope-----	49, 180, 194, 196, 225		
Wire screen-----	218		
Wires, rubber covered-----	49, 51, 52, 53, 54, 62, 66, 165, 168, 169, 185, 216, 228		
Wiring, electrical-----	49, 58		
Wiring installations-----	193		
residence-----	203		
underground-----	212		
Wood, preservative treatments of-----	189		

## X

X-ray emission, grading of high volt- age-----	143
X-ray investigations-----	143
Xylose, from cottonseed hull bran and cornstalks-----	148

## Y

Yards, railway, electrical equip- ment of-----	194
Yarns-----	168, 192, 207, 217, 224

## Z

Zinc-----	189, 199
-----------	----------







































